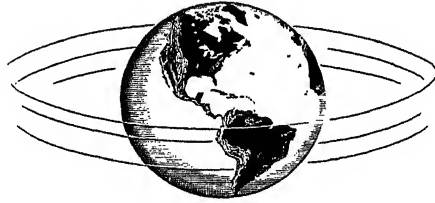






THE  
53-96  
WORLD BOOK  
ENCYCLOPEDIA

IN EIGHTEEN VOLUMES  
AND READING AND STUDY GUIDE



VOLUME 15

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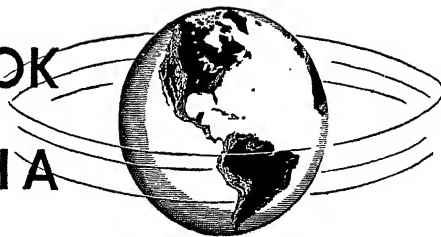
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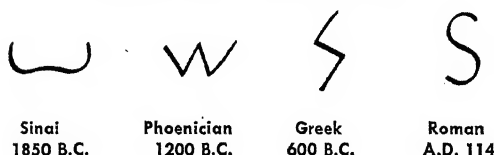
# THE WORLD BOOK ENCYCLOPEDIA



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**Ss** is the nineteenth letter of our alphabet. It was also a letter in the ancient Semitic alphabet. The *S* probably came from an Egyptian hieroglyphic sign which was the picture of a mountain with several peaks. The Semites named this letter *shin*, which means *tooth*. The Greeks turned the letter on its side and called it *sigma*.

## FROM PICTURE TO LETTER



Later they left off the lowest line. The Romans changed the straight lines into the curved form of the modern capital *S*. The letter has always stood for the same sound, except that the Semites probably gave it an *sh* sound in their language. In English *s* has four sounds: the proper *s*, or hissing sound without voice, as in *sit*; the *z* or buzzing sound, as in *music*; the *sh* sound, as in *sure* and *mansion*; and the *zh* sound as in *decision*. See also ALPHABET; PRONUNCIATION. E.F.D.

**SAADI**, or **SADI**, *sah DE* (about 1184-1291), was a great Persian writer and poet. He was born at Shiraz. Under the protection of his patron, the Prince of Fars, he studied philosophy in Baghdad, and while there won fame by his writings. The Mongols deposed his patron in 1226, and Saadi, in discouragement, became a wanderer. He lived for some time in Damascus, and then went to Jerusalem. There he lived as a hermit until he was captured by some Frankish crusaders and taken as a slave to Tripoli. A wealthy friend finally rescued him and he returned to his home.

The most important of his twenty-two works are the *Bustān* (Fruit Garden) and the *Gulistān* (Rose Garden), in prose and verse. Both of them were written near the end of his life. They are made up of discussions of philosophic and religious questions, interesting tales, wise sayings, and lyric poetry. Saadi's works were the first Persian literature to be introduced into Europe. P.M.B., JR.

**SAALE**, *zAH leh*, **RIVER**. See GERMANY (Rivers, Lakes, and Bays).

**SAAR**, *zahr*, is a district on the Franco-German border. It is sometimes called the Saar Territory, or Saar Basin. The Saar covers an area of 1,154 square miles in the western Rhineland near Alsace and Luxembourg. The region has many coal mines and steel foundries. For this reason Germany and France have

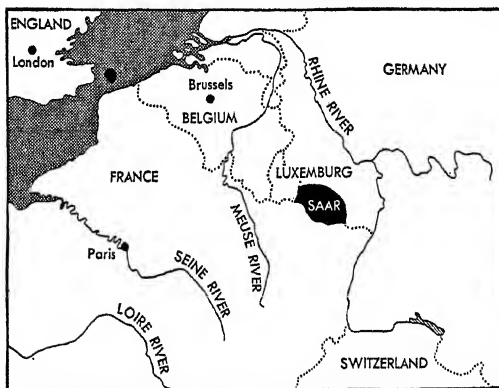
often disagreed over the control and ownership of the Saar.

After World War I, France wanted to annex the Saar in payment for war damages. The Treaty of Versailles gave France the use of the Saar coal mines for fifteen years. This was in payment for the French coal mines that the Germans had destroyed during the war.

The League of Nations governed the Saar during the period of French occupation. The governing body included one Frenchman, one German inhabitant of the Saar, and three persons of other nationalities. Germany protested against the foreign occupation, and in 1930 the League of Nations ordered an end to the allied control.

Most of the people of the Saar were Germans. In 1935 the Saarlanders held a general vote, or plebiscite, according to the terms of the Treaty of Versailles. The Saarlanders voted by a large majority to return to German control. After the plebiscite, the League Council awarded the Saar to Germany.

The Saar was the scene of much fighting during



Location Map of the Saar Basin in Germany

World War II. French troops occupied the Saar after World War II, and the struggle for control of the rich region continued. D.E.L.

**SAARBRÜCKEN**. See GERMANY (Cities).

**SAAR RIVER** is a waterway of northern France and southern Germany. It rises in the Department of Moselle and flows north and then northwest for eighty-four miles into Rhenish Prussia. There it joins the Moselle River. The valley of the Saar is one of Europe's most important industrial centers and many wars have been fought over this area. See also SAAR. H.U.S.

**SAAVEDRA LAMAS**, *sah ah VA thrAh LAH mahs*, **CARLOS** (1880- ), received the Nobel peace prize in

1936. He served Argentina at the Montevideo and Buenos Aires conferences in 1933 and 1936, and figured prominently in the settlement of the Chaco dispute between Paraguay and Bolivia.

Saavedra Lamas was born in Buenos Aires, and was educated at the University of Buenos Aires. He wrote numerous books and pamphlets on educational, social, and political matters. He was one of the founders of the University of La Plata, and served as rector of the University of Buenos Aires. As Minister of Foreign Affairs from 1932 to 1938, he represented Argentina at numerous conferences abroad. He sponsored the Argentine Anti-War Pact of 1933, and presided over the Assembly of the League of Nations in 1936. E.T.P.

See also NOBEL PRIZES.

**SABATIER**, *sah bah TTAAT*, PAUL (1858-1928). See FRANCIS OF ASSISI, SAINT.

**SABATINI**, *sah bah TE nee*, RAFAEL (1875- ), is an English novelist, short-story writer, and playwright. He is probably best known for his historical romances. He was born in Jesi, Italy, of an Italian father and an English mother. Sabatini went to school in Switzerland and Portugal. In 1905 he married an Englishwoman and later became a British subject.

His first historical novel, *The Tavern Knight*, appeared in 1904. Sabatini's works had become extremely popular by 1921, when his best-selling novel, *Scaramouche*, was published. Sabatini's novel *Captain Blood* was also an outstanding success. L.J.

His Works include the novels *The Sea Hawk*, *The Life of Cesare Borgia*, *The Lion's Skin*, and *Columbus*; and the plays *In the Snare*, *The Tyrant*, and *The Rattlesnake*.

**SABBATH**, *SAB ahth*, is the rest day of the Jews. It comes on Saturday, the seventh day of the week. Today, the Christians also use the word Sabbath for their Sunday.

In ancient Hebrew history, the Sabbath was a joyous, holy day. On the Sabbath people stopped working, visited the temple, and offered a double number of sacrifices. One of the Ten Commandments (Exod. 20:8-11) is about observing the Sabbath. The two ideas behind its observance were rest and worship. These laws applied to both master and servant, and to both man and beast.

After the Babylonian exile, Sabbath observance became very strict. The Jews suffered many losses and insults rather than break the Sabbath laws. In the oral law, twenty-nine major and minor kinds of labor were forbidden. These included bearing burdens, gathering sticks, lighting fires, and traveling more than a Sabbath day's journey (less than a mile). The attitude of Jesus in regard to these regulations is expressed in the saying, "The Sabbath was made for man, and not man for the Sabbath" (Mark 2:27). Since Christ rose from the dead on the first day of the week, the observance of Sunday as a holy day has been generally adopted in the Christian Church. The Seventh-Day Adventists are about the only Christians who consider Saturday as the Sabbath. L.L.M.

See also SUNDAY.

**SABBATH DAY'S JOURNEY**. See SABBATH.

**SABER**, *SA ber*. See FENCING.

**SABER-TOOTHED CAT**, or **SABER-TOOTHED TIGER**, was a cat that lived in North America in very ancient times. This cat is no longer living today, but its remains

have been dug up in various parts of North America. The saber-toothed cat gets its name from the peculiar shape of its two upper canine teeth. These teeth were curved like the swords which are called sabers. They had very sharp edges. They were sometimes as long as eight inches. With these teeth, the cat was able to stab its prey much as if it had two swords.

The saber-toothed cat is believed to have been larger than the present-day tiger, with a shorter tail and shorter legs. P.O.McG.

See also ICE AGE.

**Classification**. The saber-toothed cat includes the genera *Machairodus* and *Smilodon*. The most common species is *Smilodon californicus*.

**SABINE**, *SA bine*, was the name of an ancient people of Italy. Legends tell that early Roman youths carried off the daughters of the Sabines. According to the stories, Romulus built Rome and then found that the city had few women inhabitants. He therefore called upon neighboring cities and asked that his Romans be permitted to choose wives from among their women. When the cities refused to grant this request, Romulus invited all the surrounding people to attend a great festival. During the festival games, the Romans carried off the young Sabine women by force.

The Sabines went to war with the Romans to punish the Roman youths. But finally the war spirit cooled, and the Sabines and Romans joined together to form one nation. The Sabines settled on Quirinal Hill just outside the walls of ancient Rome. W.S.F.

See also ROMULUS AND REMUS; TARPEIAN ROCK.

**SABINE PASS**, located in southeastern Texas, connects the Sabine and Neches rivers with the Gulf of Mexico. See SABINE RIVER.

**SABINE RIVER**. This important waterway in Texas and Louisiana is 500 miles long, and drains an area of 20,440 square miles. The river rises in Hunt County, in northeastern Texas, flows southeast for 250 miles, and then turns south. It forms two thirds of the boundary



The American Museum of Natural History

The Saber-toothed Cat of prehistoric times had a powerful body, thick legs, and huge clawed feet. Its long fangs were pointed down and the jaws had an enormous stretch. Unlike modern cats, these killers attacked by striking downward, slashing veins and arteries until the victim bled to death.



Brown Bros.

**The Roman Kidnapping of the Sabine Women** is a legend about the founders of Rome. Romulus, the Roman leader, invited

the Sabine tribe to a festival. The Romans needed wives, so they seized the Sabine women and carried them away.

between Texas and Louisiana. The Sabine then flows through Sabine Lake and Sabine Pass, and empties into the Gulf of Mexico. Large, ocean-going vessels enter Sabine Pass and sail as far up the river as Orange, Tex., a lumbering center, and the principal city on the banks of the Sabine River. The city of Port Arthur, Tex., is on the western shore of Sabine Lake. L.D., Jr.

**SABLE**, *SA b'l*, is a small animal of the weasel family. It has the most valuable pelt of all weasels. It lives in Siberia and is closely related to the North American *pine marten*, or *American sable*. The sable is usually about twenty-seven inches long, including the seven-inch tail. Its fur is a lustrous dark brown, and covers even the feet and soles. Depending on the region, however, sables range in color from blackish to yellowish brown. There are grayish-yellow or orange spots on the throat. The sable's coat does not change to white in winter, as do those of some animals. In European countries, sable is used in the robes of rulers and officials. Elsewhere, it is made into the most expensive kind of women's fur clothing.

Sables are found from eastern Russia, across Siberia

to Hokkaido, in northern Japan. Because of the demand for fur, the animals have been killed off in the western and southwestern portions of the former range, and are rare almost everywhere. The U.S.S.R. has closed the trapping season several times, and has experimented successfully with sable farming. V.H.C.

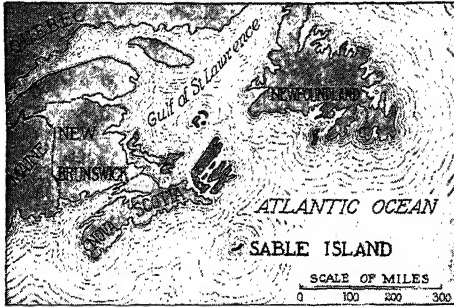
See also **FUR INDUSTRY; MARTEN**.

**Classification.** The Siberian sable belongs to the family *Mustelidae*. Its scientific name is *Martes zibellina*.

**SABLE ISLAND.** For many years, sailors called Sable Island a "Graveyard of the Atlantic." During the 1800's, more than 200 ships were wrecked off the island. Sable Island is a low, sandy arc of land about 100 miles off the southern coast of Nova Scotia. It lies on the northern lane of travel between Europe and America. The island is about twenty miles long and a mile across.

The low, sandy shores of the island are slowly sinking into the sea. In 1802 the island was about twice as long as it is now and two and a half times as wide. On several occasions lighthouses that were built on the island after 1873 were washed away and had to be rebuilt farther inland. The Canadian government has

planted thousands of trees on Sable Island to keep its shifting soil from wearing away, and to make the island easy to see from the water. It also keeps a lifesaving station, a wireless-telegraph station, and two lighthouses on the island. Canadian ships patrol the waters around the island to warn ships away from its dangerous shores.



Location Map of Sable Island

Large quantities of cranberries grow on Sable Island, and it is the home of a very tough breed of ponies. These ponies are supposed to be descendants of horses that the Portuguese left here in the 1500's. D.C.H.

**SABOT**, *sah BO*. See BELGIUM (Location, Size, and Surface Features).

**SABOTAGE**, *SAB oh TAHZH*, is any means of damaging machinery or slowing down work to force employers to grant demands of workers. The word comes from the act of dissatisfied French workers of the 1800's who threw their *sabots*, or wooden shoes, into their machines to halt production. In Spain, France, and Italy, sabotage was a recognized strategy of the syndicalists, or members of anarchist trade unions. In England, forms of sabotage were called "ca'canny" or "soldiering" on the job.

The Industrial Workers of the World were advocates of sabotage as a part of workers' strategy in disputes in the United States for about ten years before World War I. During the 1930's, several C.I.O. unions developed a form of sabotage called the "slow-down" strike. The workers operated their machines at very slow speeds. This method also was used by slave laborers working in German factories during World War II.

Sabotage is generally not recognized today by organized labor. Union leaders generally favor the strike as the final resort in obtaining their ends.

Employers may be said to practice sabotage when they limit production or destroy output to maintain prices.

In wartime, sabotage by especially trained agents called saboteurs is a recognized way of damaging means of production and communications in enemy countries. Such sabotage is a crime in the United States. R.D.P.

**SAC**, *sack*, or **SAUK**, *sawk*, **INDIAN**. See **INDIAN**, **AMERICAN** (Eastern Woodsmen; Table of Tribes); **SAUK**.

**SACAGAWEA**, *SAH kah gah WA ah*, **SACAJAWEA**, or **SAKAKAWEA** (1787?-1884?), was the only woman on the Lewis and Clark Expedition. Sacagawea's name means "Bird Woman." She was born in what is now Idaho, among the Shoshone, or Snake, Indians. As a young girl she was captured by another tribe, and was later sold to a French-Canadian trader, Toussaint Charbonneau. Charbonneau and Sacagawea joined the Lewis and Clark Expedition as it passed through their countryside. Sacagawea guided the explorers through the Rocky Mountains, and traveled with them from the present site of Bismarck, N.D., to the Oregon coast and back. Sacagawea persuaded the Indians along the way to give the expedition horses and other valuable help.

Little was known of Sacagawea's life until a hundred years after the journey. Some historians contend that



Sacagawea Pointing Out the Country of Her Childhood to Lewis and Clark at her right. The daring explorers are stand-

ing at Three Forks in western Montana. Sacagawea's husband, a French-Canadian trader, stands at her left.

His. Soc. of Montana: Jarud Photo

she died on the Missouri River in 1812. Others, not without persuasive reasons, insist that she died and was buried on the Shoshone Indian reservation at Wind River, Wyo., in 1884. J.G.N.

See also LEWIS AND CLARK EXPEDITION; PORTLAND (Ore.).

**SACCHARIMETER**, *SACK ah RIM ee ter*. This is an instrument used to measure the amount of sugar in a liquid.

**SACCHARIN**, *SACK ah rin* (chemical formula,  $C_6H_4SO_2NHCO$ ), is a white crystal powder that is used for sweetening. Saccharin is a chemical compound that is made from a coal-tar product. It is 400 to 500 times as sweet as ordinary cane sugar, but contains no carbohydrates and has no food value. Saccharin is used primarily in diseases, such as diabetes, where it is harmful for the patient to use sugar. Persons dieting to lose weight often use saccharin in place of sugar. Since saccharin can not be considered as a food substitute for sugar, the United States Pure Food and Drug Laws do not allow saccharin to be used in commercial foods, such as candy, soda drinks, or preserves. Such use, however, is a common practice in many other countries.

Saccharin is often made into tiny tablets. A half-grain tablet of saccharin is usually equal to one teaspoon of sugar. Saccharin was first discovered in 1879 by a German chemist, Constantin Fahlberg, and an American chemist, Ira Remsen. See also SORGHUM. G.L.Bu.

**SACCULE**, *SACK yool*. See EAR (Inner Ear).

**SACHS**, *zahks*, **HANS** (1494-1576), was a German poet who became the most famous of the mastersingers. He was the leading character in Richard Wagner's opera *Die Meistersinger*. Sachs was born in Nürnberg, and learned the trade of shoemaking. He had a good education and studied the poetry and music of the mastersingers. His songs, fables, and dramas soon became famous. In 1516 he settled in Nürnberg. Sachs was interested in Martin Luther's religious teachings, and his works favored the Protestant Reformation. His some 6,300 works are humorous and sentimental. They teach lessons but in a pleasant fashion. See also MASTER-SINGER. P.M.B., Jr.

**SACKVILLE**, New Brunswick (population 2,489), is a town near the border of Nova Scotia, about 127 miles east of Saint John. Sackville lies at the edge of the Tantramar Marshes, around which the early settlers built dikes. The name *Tantramar* comes from a French word meaning a *racket*, or *hubbub*. The name well describes the undrained parts of the marshes, where migrating ducks and geese make the region noisy with their calls during the spring and fall.

Sackville is the center of a farming district noted for the growing of small fruits, especially strawberries. Rich hay for feeding livestock is grown on the marshes. The town has a number of industries, including a stove foundry. Sackville is the home of Mount Allison University. The town is on the main line of the Canadian National Railway. M.J.T.

**SACKVILLE-WEST**, **VICTORIA MARY** (1892- ), is an English novelist and poet. Her first book of poems, *Passenger to Teheran*, was based on her life in Persia (now Iran) as wife of the diplomat, Harold Nicholson. Travel took her to Hungary, Bulgaria, and Morocco also, but

she preferred to write mostly about England. She described her birthplace, Knole Castle, Sevenoaks, in *Knole and the Sackvilles*. G.S.B.

**Her Works** include *Heritage*, *The Edwardians*, *All Passion Spent*, and *Grand Canyon*, novels; *Aphra Behn* and *Andrew Marvell*, biographies; and *King's Daughter*, *Collected Poems*, and *Solitude*, poetry.

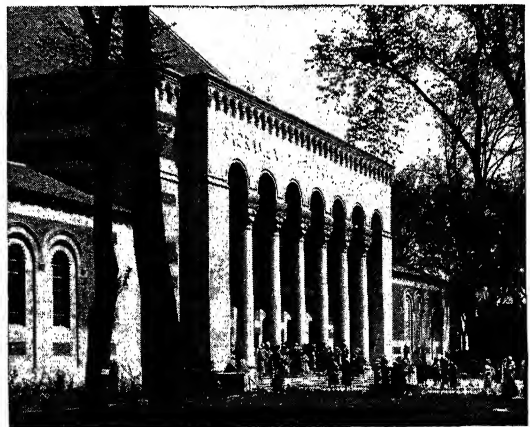
**SACO, SAW koh, RIVER**. See MAINE (Rivers and Lakes); NEW HAMPSHIRE (Lakes and Rivers).

**SACRAMENT**, *SACK rah ment*, is a solemn observance in the Christian Church. It is an outward sign that a faithful worshiper is receiving the grace of God. The Eastern and Roman Catholic churches have seven sacraments — Baptism, Confirmation, Holy Eucharist, Penance, Extreme Unction, Holy Orders, and Matrimony. Most Protestant churches recognize only two — Baptism and the Eucharist, or the Lord's Supper. Quakers do not observe the outward forms, but practice "spiritual sacraments." Roman Catholics believe sacraments aid in their salvation. Most Protestant churches see them as visible signs of an agreement between God and the individual. See also BAPTISM; EUCHARIST; EXTREME UNCTION; MARRIAGE. F.J.S.

**SACRAMENTO**, Calif. (population 105,958). This state capital is one of the West's most historic cities. It was founded in 1839 as New Helvetia by Captain John A. Sutter on a land grant from the Mexican government. The settlement became the first outpost of white civilization in inland California. Today Sacramento is the industrial, financial, shipping, and trading center of California's Central Valley.

**Location and Size**. Sacramento lies on the Sacramento River about seventy-five miles northeast of San Francisco. The city covers an area of 13.7 square miles. Sacramento has much of the appearance of a Southern river town. The residential sections are noted for green lawns, trees, and attractive homes. The domed California capitol and other state government buildings are excellent examples of Spanish architecture.

**The People**. The city's population is made up of many nationality groups. There are Mexicans, Italians, Chinese, Japanese, and Filipinos, as well as many descendants of pioneer German and Swiss settlers. Many families are descendants of people who came to California



Clarence Burkett

Memorial Auditorium in Sacramento, Calif.



with the general westward movement of the 1850's.

**Industry and Trade.** The chief industries of Sacramento are connected with the processing, packing, and shipping of the products of the farming region surrounding the city. There are large fruit and vegetable canneries, slaughtering and meat-packing plants, flour and feed mills, dairy produce plants, and other food-processing industries. At least one crop is harvested and processed each month.

Large ships can sail up the Sacramento River to load freight shipments at the Sacramento wharves. The city is served by four railroad lines and by motor-freight and bus routes. Sacramento is also an important aviation center. There are several civilian airports in addition to Mather Field, an army flying instruction base.

**History.** Captain Sutter's New Helvetia was formally laid out as a town in 1848 and the name was then changed to Sacramento. Sutter's Fort, near by, was the western terminal of the wagon trains of the early pioneers of the West. Sacramento became the center of mining activities in the great gold rush following the discovery of the precious metal at Sutter's Mill in 1848.

In 1850 the first California legislature incorporated Sacramento as a city and selected it as the site of its first assembly. The city was made the permanent capital in 1854. The first transcontinental railway, the old Central Pacific (now Southern Pacific), was begun here in 1863 and completed in 1867. It was promoted and financed by citizens of Sacramento.

P.R.H.

**SACRAMENTO RIVER** is the largest waterway in California. It drains the fertile Sacramento Valley in the northern part of the Central Valley of California. The river rises near the slope of Mount Shasta and flows south into Suisun Bay. The Sacramento River is about 400 miles long, and it drains an area of 27,100 square miles. Small boats can sail to Red Bluff, about 250 miles above

the river's mouth. Larger ships can sail to the city of Sacramento.

The main branches of the Sacramento are the Pit, Feather, and American rivers. Many smaller streams join the river from the Sierra Nevada and the Coast Range. Many of these pass through gold-mining country.

In 1938 the Shasta Dam and Reservoir, part of the Central Valley Water Project, was begun on the Sacramento River. The purpose of the project is flood control, irrigation, and power. Four bridges cross the Sacramento River to handle railroad and motor traffic around the reservoir.

L.D., JR.

See also CALIFORNIA (Rivers, Lakes, and Waterfalls).

**SACRED COLLEGE** is the entire body of cardinals, who are appointed by the Pope and share with him the government of the Roman Catholic Church. In influence and position they are second only to the Pope himself. Their number has varied from time to time, but has been fixed at a maximum of seventy since the order of Pope Sixtus V. Of these, six are cardinal bishops, fifty may be cardinal priests, and fourteen, cardinal deacons. In general, their duties consist of administering the affairs of the Church under the direction of the Pope. But their greatest responsibility comes after the death of the Pope. Then they must meet to elect one of their own members as his successor. During this election they are subjected to strict discipline, and have no contacts with the outer world. See also CARDINAL; POPE.

F.J.S.

**SACRED GEESE.** See GOOSE (History and Literature).

**SACRED HEART OF JESUS, SOCIETY OF THE,** is a Roman Catholic society of women, established for the education of youth and to provide centers for retreats. It was founded in Paris in 1800 by St. Madeleine Sophie Barat. The society has 153 houses, which include colleges, academies, and elementary and high schools. The schools are located in twenty-nine different countries, including the United States, Canada, Cuba, and Mexico. The mother house is located in Rome.

F.J.S.

**SACRED MUSIC** is music written with a religious subject or theme. It is used chiefly in church services, but it is often played or sung by many types of musical organizations.

In the Middle Ages the music of which we know most was mainly a religious art, and it was sung by choral groups in the Roman Catholic Church. The earliest form of sacred music was the *plain song*, or melody without regular rhythm. It was unaccompanied by musical instruments and was presented by groups of voices chanting together in unison. The first organized plain song was Ambrosian chant (approximately A.D. 300), and Gregorian chant, which became a part of the Church liturgy about 600. Since the 900's the organ has been used in churches to accompany the singing, although its use was banned at certain times.

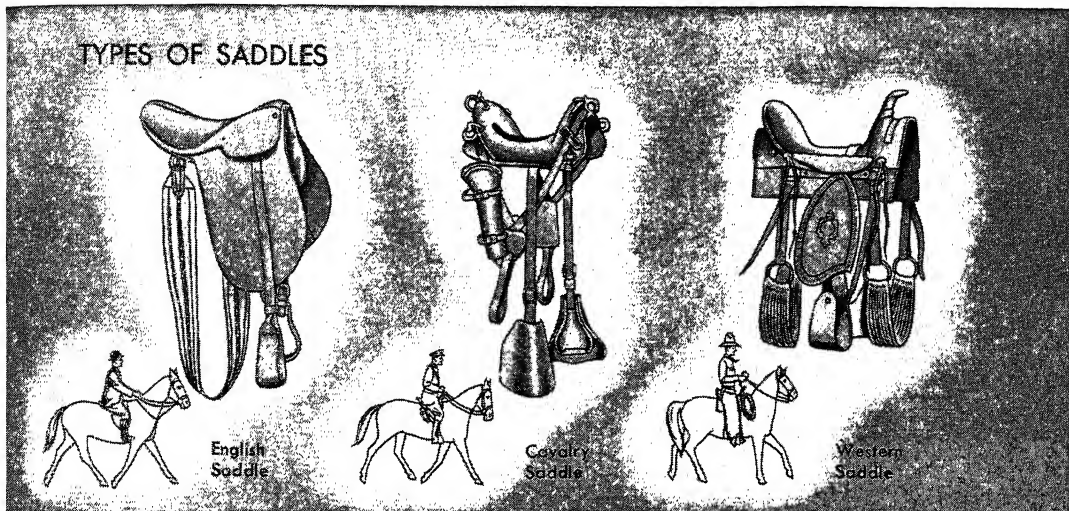
Church congregations had little part in the singing of services until the time of the Protestant Reformation. Martin Luther was one of the first persons to make congregational singing popular. He is believed to have composed several hymns and chorales. Hymns are now an important part of most religious services, both Catholic and Protestant. Other types of vocal sacred music are anthems, cantatas, and oratorios. A cappella singing is done without musical accompaniment. Bach, Handel,



Clarence Burkett

**A Steamboat Race on the Sacramento River** recalls the former glory of the mighty stream—once the state's greatest avenue of traffic. It is still an important artery of water-borne commerce in California's great Central Valley.





and Mendelssohn are among the many composers who wrote church music. R.KEN.

**Related Subjects.** The reader is referred to:  
A Cappella Music (Gregorian Chant;  
Cantata Part Music)  
Chorus Oratorio  
Hymn

**SACRED WAY.** See ROME (How City Looked).

**SACRIFICE** is a word used to mean a kind of religious ceremony in which some sort of gift is given to a god or gods. Sacrifices are performed to gain something for an individual or group. The things sacrificed have included human beings, animals, and fruits of the earth. Sometimes these were burned (burnt offering) or destroyed. Sometimes they were partly destroyed, and the rest was eaten by the priests and people. Sometimes the sacrifices were simply left at the altar or holy place. In some religions these sacrifices provided the incomes of the priests and the sacred places, or shrines. Sacrifices were used for many purposes. Sometimes they were intended to increase the food supply. Sometimes they were to help the individual or the group with a problem. Often a sacrifice was made in order to free a community from guilt (guilt offering) or sin, to bring it into right relations with a divine power, or to bring peace (peace offering).

Some of the ceremonies were supposed to bring the desired results by themselves. Others were offered to get the gods to help man. The Buddhist and Islamic religions gave up the custom of making sacrifices. After Christianity separated from the Jewish faith, it taught that Christ's sacrifice made others useless. A.E.H.

**SACRISTY, SACK** *ris tih*. See CLOISTER.

**SACROILIAC, SAY** *kroh IL ih aek*, **JOINT**. This joint connects the backbone with the pelvis. The V-shaped sacrum bone near the bottom of the backbone fits like a wedge between the wide wings of the hipbone (ilium). The bones are connected by plates made up of cartilage and by ligaments. Inflammation or strain on this joint is a common cause of an aching of the lower back. A.B.H.

**SACRUM, SA** *krum*. See PELVIS.

**SADDLE.** A saddle is a seat used by a rider on a horse. There are many different kinds of saddles. They range from a mere blanket, such as the Indians used, to the

saddle of the feudal knights, which supported them firmly to hold them on the horse when they were struck with a lance or spear. The knight's saddle had a back support which rose from the seat to about the middle of the back and curved around to both sides of the rider.

The main parts of most saddles are a *seat*, usually made of leather, a strap, or *girth*, underneath the horse which may be tightened to make the saddle secure, and *stirrups* for the rider's feet. There is usually a *pad* under the seat to protect the horse's back from irritation, and a leather *skirt*, which hangs down on both sides of the horse to protect his sides. The two most common saddles in America are the *English* and the *Western*. The English saddle is almost flat, with only a slight curve in the seat. The front of the seat comes to a slight point called the *pommel*, while the back is wider and slightly raised to make the *cantle*. The Western saddle has wide stirrups, a high cantle, and a pommel raised to make a horn to which a lariat may be fastened. G.MAN.

**SADDUCEE, SAD** *yoo see*. The Sadducees were members of a religious group which was active in Judea until Jerusalem fell in A.D. 70. They had a strong influence throughout Roman times in Judea. Many of them belonged to the wealthy class and held high political and religious offices. They were especially powerful in controlling the political and civil Sanhedrin, or high court. The Sadducees were different from the Pharisees in that their religious beliefs and practices were all based on the written law of the Old Testament. They did not believe in immortality, as the Pharisees did. Sadducees said the soul died with the body. They also believed that each person had "free will," or was responsible for whatever good or evil befell him. The Sadducees believed that every individual should interpret the Scriptures for himself. See also PHARISEE. L.L.M.

**SÁ DE MIRANDA** (1485?-1538). See PORTUGUESE LITERATURE.

**SADI.** See SAADI.

**SADOWA, SAH** *doh vah*, **BATTLE OF.** See SEVEN WEEKS' WAR.

**S.A.E. RATING.** See HORSEPOWER.

**SAETER, SE** *ter*. See NORWAY (Agriculture).



De Palma, Black Star; Gendreau

**SAFETY.** All through the ages, man has struggled for safety. Primitive man lived in caves or in treetops to be safe from wild beasts and savage primitive tribesmen. He had to be constantly on the alert to protect himself and his family from ever-lurking dangers. Those who survived learned to protect themselves by pulling up the ladder of vines or by rolling a rock before the mouth of the cave.

Gradually, man invented various weapons and tools, and made discoveries which brought greater comfort and safety. As civilization developed, more and more hazards were overcome. Better homes were constructed. Bridges and roads were built which could be traveled with less fear of accident. Larger and safer ships sailed the seas. The number of dangerous animals grew smaller.

many of the natural dangers faced by men of old gradually disappeared, they were replaced by dangers which often proved to be even more dangerous. Man created to serve men all too frequently became a destroyer. Man's ability to invent and construct machines has developed faster than his ability to use them safely.

Other factors that have increased the dangers of modern living are men's dependence upon each other, and congested living conditions. When the country was less densely settled and each person was more dependent upon his own activities for satisfying most of his wants, what one individual did had little effect upon others. Today, the careless act of a bus driver, a railroad worker, an airplane pilot, or a factory mechanic may endanger the lives of many persons.

It is a fact that most accidents are caused by carelessness and could be prevented. Many industrial plants have greatly reduced the number of accidents by placing the proper safety devices and guards on machines and by insisting upon orderliness and caution on the part of workers. Many cities have reduced the number of traffic accidents by proper law enforcement and by the education of motorists and pedestrians. If all persons used good judgment and exercised proper care, a large majority of accidents would never happen, and countless deaths and injuries would be avoided.

Practicing safety does not compel a person to live a drab, uninteresting life. Courageous adventurers are

great believers in safety. Explorers, aviators, and "dare-devil" race drivers make careful preparation and take every precaution to make their undertakings as safe as possible. They are living examples of how carefulness makes great adventure possible. Everyone who wishes to live a successful and colorful life must take adequate precautions so that his adventures will not be cut short by accidents.

### Safety at Home

"Safe at home" is an expression one often hears. From earliest times down to the present, home has been regarded as a refuge from harm. Yet about half of all the injuries and one third of all the deaths caused by accidents occur in homes. This is shown by figures gathered and published by the National Safety Council. Certainly with such an accident record as this there are many homes that do not deserve to be considered refuges. Parents and children alike need to make a careful study of their homes to see how they can be made safer places in which to live.

**Prevention of Falls.** About three out of every four deaths resulting from home accidents are caused by falls. This is a serious cause of injury to persons of all ages, but particularly to elderly persons.

Many falls are caused by poor housekeeping, such as not mending ripped seams and worn places in rugs. Another chief cause of falls is oil, grease, or water spilled on the floor and left there instead of being wiped up immediately. Even good housekeepers sometimes do not have the imagination to recognize a hazardous condition before it causes an accident. Thus they are proud of their highly polished, slippery floors, and they make such places like the top and bottom of a flight of stairs dangerous by using small rugs which slide easily in such spots.

The good housekeeper who wishes her family to be really safe at home will be on the alert to eliminate such dangers. She will see that small rugs are kept in place with rubber underpads called rug anchors. Rubber mats will be used in slippery showers and bathtubs. Objects will be kept in their proper places when not in use. Toys, clothing, and household utensils will not be left lying on the floor or steps for persons to stumble over. Sidewalks

and steps will be kept free of ice by the use of sand, salt, or ashes when necessary.

Allowing houses to get in bad repair frequently causes falls. Stair treads must be firm, and stair and porch railings should be kept in good condition. Lights should be placed at the head and foot of stairways and in hallways which would otherwise be dark.

Special precautions should be taken when there are very young children in the home. Safety gates at the head and foot of stairs and firm hooks on window screens save them from dangerous falls. They should be placed in safe play pens when they are not being watched, and when they are put in a carriage or high chair they should be securely fastened in.

Many falls are caused by thoughtless acts. One of the most common of these is attempting to reach a high place by using a rocking chair or box instead of a firm stepladder. Every person should try to make thoughtfulness a habit. He should walk up and down stairs carefully, use special care when carrying large bundles or objects, turn on the light whenever possible before entering a dark room, avoid sitting on window sills or leaning out of windows, and not tilt back in a chair but keep the chair legs firmly on the floor.

**Prevention of Burns and Scalds.** Burns and scalds are second only to falls as a cause of accidental deaths in the home. Like falls, many burns and scalds are caused by poor housekeeping and careless acts. Matches should be kept in a safe, nonflammable container well out of the reach of young children and away from the heat of stoves or pipes. Here are some safety rules to help you avoid burns. Always strike a match away from the body so that if the head flies off it will not set fire to your clothing. Do not take lighted matches or candles into clothes closets or other places where inflammable material is stored. If you use candles or lamps for lighting, place them on a firm base and put them out before the last person leaves the house or goes to bed.

Many serious burns or scalds are caused by the use of inflammable cleaning fluids, which are highly explosive. It is far better to have dry cleaning done by a commercial cleaner and dyer than to take foolish chances with fluids containing gasoline or benzene. Kerosene is another fluid which frequently causes burns and fires. It should never be used in starting a wood or coal fire.

Burns or scalds usually occur near stoves or fireplaces. These places are safe if common sense and careful action are practiced. Fireplaces should be screened. The handles of pots and pans containing hot liquids or foods should be turned toward the back of the stove so that they are not likely to be reached by young children or accidentally upset by older persons. When lighting gas ovens, the doors of both broiler and baking ovens should be open before the match is lighted, so that gas cannot accumulate and explode. The flames from burning fat should be put out by smothering the fire with sand or a metal cover. See BURNS AND SCALDS; FIRE PREVENTION.

**Prevention of Poisoning.** Accidental poisoning causes many deaths in homes each year. The contents of medicine cabinets should be put out of the reach of young children. Many of the medicines are harmful if not

taken in the proper doses and for the proper purposes. It is wise to mark distinctly all bottles containing poisonous substances so that they will be readily recognized. One should always look at the label on the bottle before taking medicine and should never take medicine in the dark. A careful householder inspects the medicine chest frequently and throws away the bottles of old medicine for which there is no longer any use.

Many common household supplies such as ammonia, lye, Lysol, and cleaning powders are poisonous and should be kept locked up. Foods that are not fresh or properly cared for sometimes become poisonous. A list of antidotes to offset the effects of common poisons should be kept handy in every home. Everyone should know the simple first aid for accidental poisoning—washing out the stomach again and again. See ANTIDOTE.

**Prevention of Asphyxiation.** Many lives are lost because of escaping gas. A careful householder makes certain that there is good ventilation when gas appliances are used, and provides vents for disposal of fumes. He also uses metal piping instead of rubber for gas connections. He sees that the gas cocks fit tightly enough to prevent the control key from being turned too easily. He knows that pots which may boil over and extinguish a gas flame should not be left unwatched. He is careful to report all gas leaks to the gas company immediately and keeps his furnace in good repair to prevent coal gas from escaping.

Carbon-monoxide poisoning which results from inhaling fumes from the exhaust of an automobile engine, can be avoided by running the engine only in the open or in a garage with a wide-open door.

Asphyxiation is also caused by stoppage of breathing due to mechanical reasons. Small hard substanses as coins or marbles should be kept out of the mouth since they may become lodged in the windpipe. Young children sometimes suffocate while in the bed. A young child's covers should be fastened so they cannot be pulled over his head, and only one pillow, or none at all, should be used. See ASPHYXIATION.

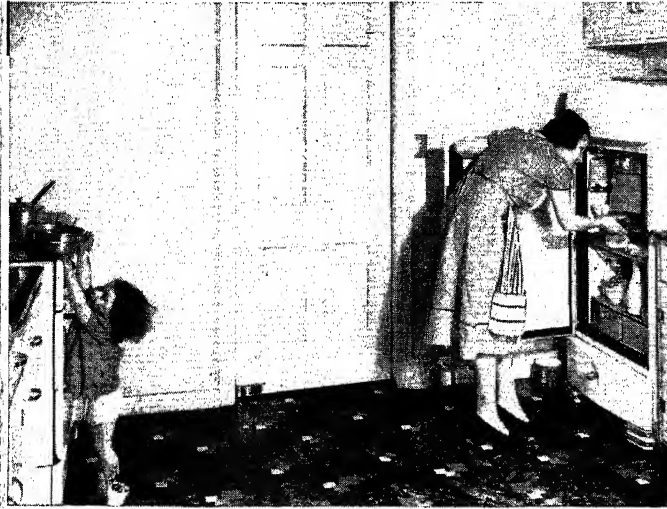
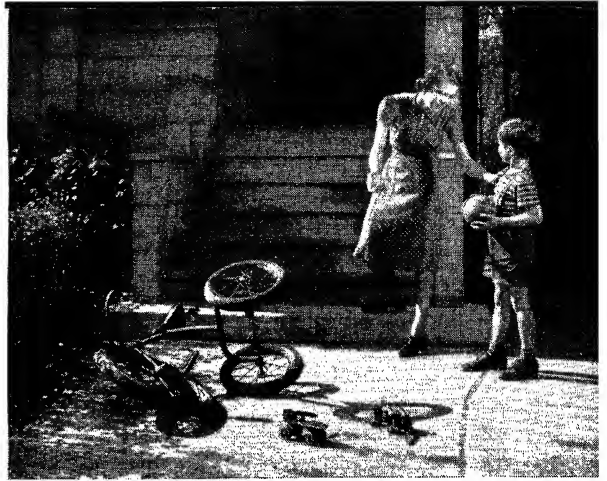
**Prevention of Cuts and Scratches.** Cuts and scratches, like other accidental injuries, are usually the result of someone's carelessness. They may result in serious infection, and may even prove fatal. Young children can not safely handle glassware and sharp and pointed objects, and these should be kept out of their reach. Tacks, pins, and needles should be picked up as soon as dropped. Boards with nails sticking out, or materials with sharp edges, should be stored in a safe place. A person using a knife should cut away from himself. He should walk carefully when carrying sharp or pointed objects.

**Safe Use of Electricity.** Defective electric wiring or appliances occasionally are the cause of destructive fires and fatal electric shock in the home. It is a good rule to have all electric wiring done by a competent electrician and to use only high-grade electrical appliances. Most good wiring and appliances bear the seal of inspection and approval of the National Board of Fire Underwriters. Electric cords and connection plugs should be inspected regularly and those that are worn replaced without delay. Cords should not be run over

# SAFETY

## IN THE HOME

Tricycles, roller skates, and other toys left on steps and stairways, *right*, often lead to serious falls. Even the very young child may help by learning to put away his playthings carefully.



The small child taken to the kitchen but not placed in a play pen or elsewhere out of danger is often fatally scalded or badly scarred when she reaches for pans on the stove, *upper left*. To avoid such an accident, the safety-conscious mother keeps a watchful eye on her child and puts all hot pots and pans out of reach. A firm stepladder is safer for use in climbing than a chair, *upper right*, which tips and

often causes serious falls. Rubbish in attic and basement is a constant fire hazard. This boy, *lower left*, having learned such facts in a school safety class, is removing boxes, rags, and old papers. Because rickety steps and porch railings are the cause of many falls, this man, *lower right*, makes all needed repairs without delay to prevent possible accidents, often costly in pain, time, and money.







## IN STREET, OFFICE, AND FACTORY



Many accidents occur, *top right*, when motorists take their eyes off the road, *top left*. Careful pedestrians cross the street at the proper places, obey traffic lights, and watch for approaching automobiles. They know that "jaywalking," *upper left*, may cost time and money and even result in injury or death. The innocent-looking paper clip and

rubber band in the hand of a prankster, *upper right*, may doom another to a lifetime of blindness. Spilled grease, *lower left*, is a hazard everywhere and should be removed at once. Safety in the shipping room requires that workers keep all passageways clear of obstructions and watch where they are walking, *lower right*; otherwise, accidents may result.

These photographs were selected from a film used in the Safety Zone Program sponsored by the Zurich Group of Insurance Companies.



radiators or steam pipes, nor should they be run under a rug or through a doorway, as the constant walking on the rug and closing of the door may wear off the insulation.

A person should avoid touching an electric cord or fixture while his hands are damp or while he is in the bathtub. Electrical appliances should be disconnected when they are not in use. They should be disconnected carefully by their plugs, not by pulling the cord, for this tends to loosen the connection and is a frequent cause of trouble.

**Other Home Hazards.** It is impossible to describe all the hazards of the modern home. Each year new appliances are invented for use in the home and many of these require special precautions if they are to be used safely. Some good rules to follow are: never use any equipment carelessly; always keep the safeguards in place on dangerous parts; never oil machines while the motor is running; and carefully follow the directions for use and upkeep. Thoughtlessly getting too close to exposed moving parts such as the wringer of the washing machine and the blades of the electric beater is the cause of many serious accidents.

#### Safety at School

Special safety precautions need to be taken wherever large numbers of persons congregate. That is why there are laws requiring safe construction, inspection, and use of such buildings as theaters and schools. New buildings must be of fireproof construction. Old buildings which were not constructed according to the provisions of the new codes must be provided with outside fire escapes. In all buildings, exits must be clearly marked, and doors must swing outward and open easily.

Not only is it necessary to provide safe buildings. People themselves must also be willing to obey certain rules if they are to escape injury when they are gathered in large groups. It is necessary, for example, for children attending school to follow many such regulations so that the safety of the entire student body will be assured.

**Gymnasiums and Athletic Fields.** About one third of all the accidents in school buildings happen in gymnasiums. A large number also occur on athletic fields. This does not mean that physical education or sports should be curtailed or abolished. The benefits derived from many such activities doubtless offset the dangers that are bound to accompany almost any form of vigorous physical exercise. However, there are many more accidents in such activities than one would necessarily expect. Much can be done to reduce this number through the co-operation of students and faculty.

There would be fewer accidents if gymnasiums and playing fields were properly constructed and equipped and kept in good condition. Gymnasium floors should not be slippery. Sharp pillars and posts should be well padded. Padded mats should be provided for many activities. Apparatus should be inspected each day and kept in good repair. The surface of outdoor athletic fields should be smooth and free from holes, broken glass, and other hazards.

Persons engaging in strenuous physical activity should be in good physical condition. It is important to play games according to the rules, since most rules

are made not only to insure good sportsmanship but for the protection of players as well. Proper clothing should be worn. Running and rough play should be prohibited in locker and shower rooms.

**Corridors and Stairs.** In large schools traffic conditions in the corridors and on the stairs present an important safety problem. Here it is necessary to have common-sense rules such as: keep to the right; avoid crowding and shoving; look ahead; walk, do not run; keep corridors and stairs free from obstructions; go up and down stairs one step at a time; obey hall guards.

**Classrooms.** Injuries sometimes occur in classrooms. Here as elsewhere good order is necessary. Doors and fire escapes should be free from obstructions. Aisles and cloakrooms should be cleared of objects which might cause someone to stumble. Broken seats and desks should be reported at once, and all materials should be stored neatly in safe places.

Pupils should sit properly, keeping their feet out of the aisles and avoiding tipping back their chairs. Scissors, pencils, pens, and other sharp objects should be carried with points protected. In classrooms and halls there is little likelihood of accidental injuries if pupils conduct themselves in a mannerly way.

**Shops and Laboratories.** Shops and laboratories present special hazards because of the kind of activities carried on in them. For many years, teachers of the industrial arts have been laying great stress upon safety. They know that frequently one of the first questions asked about an applicant by an employer is, "Would he make a safe workman?" The thoughtless, "accident-prone" workman is not wanted, as he is likely to be only an expense.

The safety activities in many school shops are organized along the same lines as in industry. A pupil in each class is appointed safety inspector. He sees that his fellow students wear aprons when necessary and keep their sleeves rolled up and their neckties tucked in so that their clothing will not catch in machinery. He sees that goggles are worn at the grinder or at other places where there is danger of flying splinters and that objects on the floor are picked up. Spilled oil is immediately wiped up and oily rags are placed in metal containers. Tools are kept in the storeroom when not in use, and those that are broken are reported immediately to the instructor. Machines are used only with permission of the instructor, and the inspector insists that safety guards be in place while machines are running. Provision is made for the correct first-aid treatment when accidents do occur.

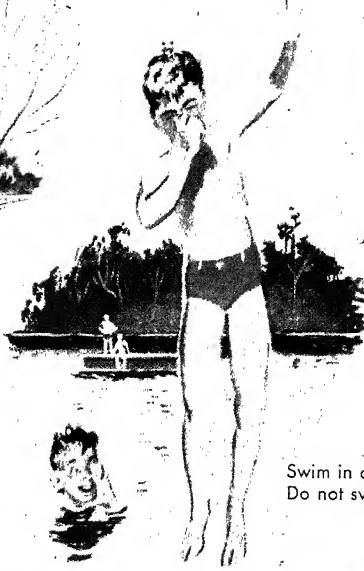
In home-economics study rooms, much of the material in this article given under *Safety at Home* is applicable. In chemical laboratories, students handle glassware, burners, and chemicals. Beginners need special instruction about how to handle these if they are to avoid accidents. Students should always read the directions and learn the precautions to be taken before beginning any experiment.

**School Grounds.** About as many accidents occur on school grounds as in school buildings. There, too, safety precautions are necessary before and after school and during the recess period, when the playground is crowded. Children should not throw things at each

# SAFETY AT PLAY



Sit quietly when boating.  
Do not go out in bad weather.



Swim in a safe place.  
Do not swim alone.



Stay off railroad tracks.



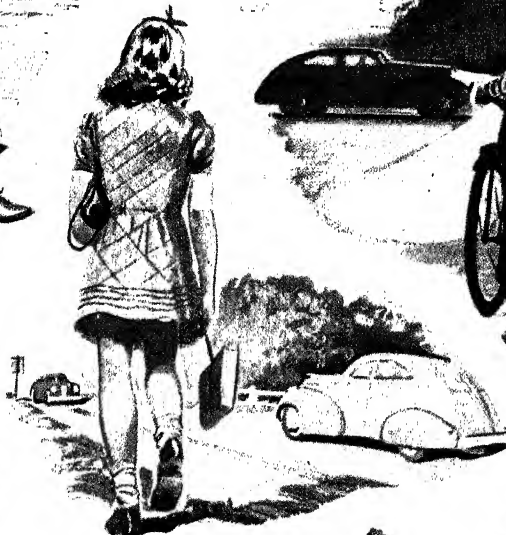
Fly kites in open fields.  
Avoid power lines.



Obey traffic signals.  
Carry a light at night.



Keep campfire small.  
Put out fire before leaving.



Walk on the left on the highway.  
Face the oncoming traffic.



Skate on ice which is safe.



Coast on the sidewalk.  
Look out for persons.

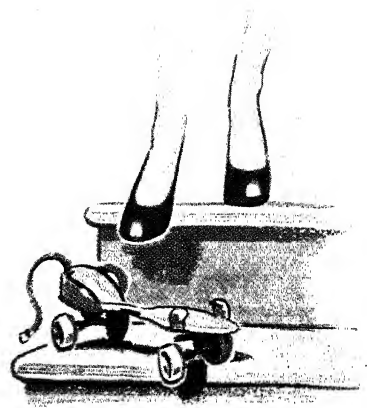


BILL FLEMING

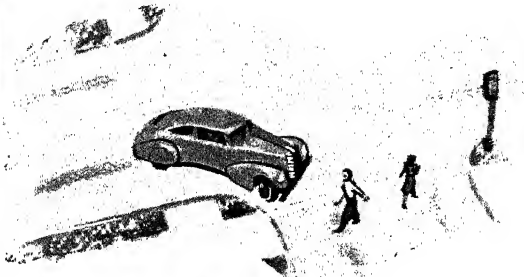
# HOME AND SCHOOL SAFETY



Obey the safety patrol.



Put away playthings.  
Avoid accidents.



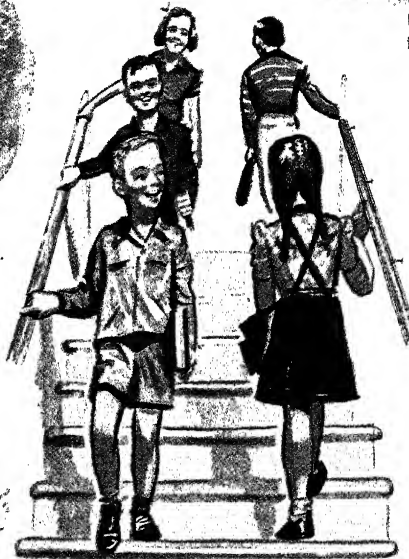
Cross streets at corners only.  
Watch for turning traffic.



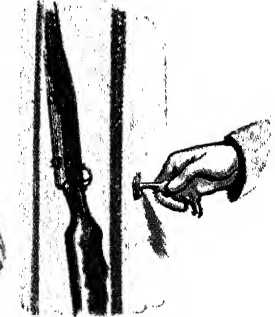
Use a screen for  
the fireplace.



Do not play with matches.



Walk up and down stairs.  
Keep to the right.



Keep guns unloaded.  
Lock them away safely.



Burn paper in wire baskets.



Clear away snow  
from walks and steps.



other or play too roughly. Groups of students should play games at a safe distance from other groups. The play space should be kept free from sticks, nails, glass, and other rubbish. All accidents should be reported immediately so that any necessary first aid can be given promptly.

#### **Safety Instruction in the Classroom**

Safety education has assumed an important place in the modern school program. Instruction in this subject extends from the earliest elementary grades through the high school. In many states, such instruction is required by law.

One of the most recent subjects to be included in the high-school curriculum is safe automobile driving. In thousands of high schools, classroom instruction in this subject is provided, and in many schools this is followed by actual road instruction. Usually this latter type of training is carried on in special cars equipped with two steering wheels, so that the instructor can take control of the car in an emergency.

**School Safety Councils.** In many schools, safety councils have been organized that are composed of pupils elected to represent the various home rooms. These councils have much to do with the safety conditions in and about the school building. They hold regular meetings and the members report to the groups they represent.

Much of the work of the safety council is done through committees. Perhaps the most important committee is the safety patrol. The inspection committee inspects the building and grounds for conditions that should be corrected. Any hazards found are reported to the proper person for remedy. The publicity committee has charge of safety bulletin boards, the safety columns in the school newspaper, and in general advertises the activities of the council. The hall committee has the responsibility of looking out for traffic conditions in the corridors and on the stairs. The accident-reporting committee collects the reports of injuries from each room each week and reports the total for the building. Many schools co-operate with the National Safety Council by sending monthly summaries of accidental injuries to that organization. The program committee has the responsibility of preparing a program for each meeting of the safety council, which follows the business meeting. This committee also prepares safety programs for school assemblies and Parent-Teacher meetings.

**Safety Patrols.** Members of the safety patrol have the important duty of helping children cross dangerous streets near the school. They are not regular traffic officers and they do not have authority to stop vehicular traffic. They take their post at the curb and keep children back from the street until it is safe to cross. If there is a traffic light they follow its directions. If there is a traffic officer they work under his guidance. If neither of these is present, the pupil safety patrols wait for a lull in traffic before they permit the children to cross. The white Sam Browne belt is the standard insignia of school safety patrols. Standard rules may be secured from the National Safety Council, which has headquarters at Chicago, Ill., or from the American Automobile Association, at Washington, D.C.

**School-Bus Patrols.** In rural sections, where school buses are used to transport children to and from school, much attention is paid to safety. State officials inspect the buses, which must be kept in safe condition. In many states, drivers have to pass examinations to prove that they are competent drivers in good physical condition. Drivers and passengers have definite rules which they must follow. Pupil bus patrols, selected from among the older pupils who ride on the bus, assist the bus driver in caring for the safety of the children. It is their duty, under the guidance of the driver, to help children get on and off the bus safely and to see that children behave properly while riding on the bus.

**Other Safety Organizations.** Other types of pupil safety organizations are founded in some schools. Among these are the Junior Motor Club, Bicycle Club, and Student Traffic Court. Safety and first aid are among the topics in which the American Junior Red Cross takes great interest. See JUNIOR RED CROSS, AMERICAN.

#### **Safety in Outdoor Recreation**

Outdoor recreation is both pleasant and healthful. Some authorities believe that children should engage in four or five hours of such activities daily. If outdoor fun is not to be spoiled by accident, certain safety precautions must be taken.

**Safety on the Playground.** City authorities are coming to realize that safe places to play must be provided for young people. If playgrounds are to be safe, those who use them must be thoughtful of others. It is necessary to keep the grounds in orderly condition, free from rubbish. Play apparatus should be kept in good repair, and should not be used when it is wet. It should be used in the way in which it was intended to be used and not for stunts.

Swings cause many accidents, especially to children who stand or play too near them while others are swinging. Wise playground attendants put white marks around the swings to show the danger line. They also insist that only one person use a swing at a time, that the person be seated while swinging, that he does not swing too high, and that he does not try to get off until the swing has stopped.

Accidents are also caused by careless use of other apparatus such as teeterboards, slides, and giant strides. Those who use teeterboards, or "teeter-totters," should remain seated and face each other. They should never get off the board without warning the person at the other end. In getting off the board, each person should be careful so as not to injure the other.

On slides, children should slide down feet first in a sitting position, being careful to keep their hands away from the sides. Before starting to slide it is wise to wait until the child ahead has stepped away from the bottom of the slide. Those using giant strides should not put their feet through the rungs of the ladder but should hang on with their hands. When they want to stop, they should run inward and stop at the pole until all have stopped swinging. It is dangerous to drop the chains and run outward.

When playing baseball, it is safer to use a soft ball unless the field is very large and no other groups are

playing near by. Batters should always drop the bat, never throw it. Onlookers should stay a safe distance away. When a ball rolls into the street, players should stop at the curb and look both ways before attempting to get it back. Baseball should *never* be played in a street or an alley.

In the spring, kite flying is a popular sport on many playgrounds. Kites should be flown where there is no danger of their being caught on electric wires. Because of the great danger of electric shock, children should never attempt to retrieve a kite that has been caught in the wires. It is dangerous to use a wet string, or to use a wire or string with wire in it for a kite string, because these conduct electricity.

**Safety while Hiking.** Hiking is among the most pleasant of outdoor sports. To enjoy this activity it is necessary to make adequate preparation. One should dress properly, according to the season of the year. Heavy shoes and stockings help to prevent blistering of the feet. There should be a first-aid kit and instruction book in every hiking party. If the group is going into wild country, it is wise to carry a compass. If knives and hatchets are carried, the blades should be covered.

When walking on the open highway it is best to walk single-file and to stay on the left side of the road facing oncoming traffic. This makes it easier to watch out for automobiles. It is a dangerous practice to hike on railroad tracks. Hikers should plan their trips so as to avoid walking on the highway after dark. If it is necessary to walk on the highway after dark, white clothing or a light will aid in giving passing motorists warning. If there is any doubt about getting safe water on the way, it is best to carry a supply of drinking water or to boil any water that must be used from the region. See INSECT; POISONOUS PLANT; SNAKE.

**Safety in the Water.** About 6,300 persons in the United States are drowned every year. Drowning deaths reach their largest number among those of high-school age. In recent years there has been an increase in the number of persons participating in water sports. That the number of drownings has not kept pace with this increase is partly due to the water-safety programs sponsored by the American Red Cross, the Boy Scouts, the Girl Scouts, the Y.M.C.A., the Y.W.C.A., public schools, and other agencies.

The number of drownings can be greatly reduced if a few common-sense rules are obeyed. Perhaps the most important of all water-safety rules is to swim only at a protected beach or pool where there is a lifeguard on duty. Other important rules to follow are: wait at least two hours after eating before swimming, to avoid stomach cramps; never go swimming alone; always be accompanied by a person in a boat when swimming long distances; be sure that the water is deep enough before diving; become an expert swimmer before venturing into deep water.

Only those who are good swimmers should go out in canoes or small boats. Before a boat is used, it should be checked carefully to make sure that it is safe. Good boatmen pay close attention to the weather and refuse to go out when a storm is brewing, or when there is a fog. They are careful not to overload the boat, not to change seats when in deep water, and not to engage in

rough play or scuffling. They know that if their boat should capsize they should cling to it since it is a good life preserver; but they should not try to climb on it.

One of the greatest annoyances and even dangers to persons who enjoy water sports is sunburn. Deaths have occurred as a result of bad sunburn. Water reflects the heat from the sun and intensifies the effect of its rays. Sunburn can be avoided by accustoming the skin to the sun's rays gradually. The first exposure should not be over ten or fifteen minutes. As a coat of tan is acquired, the duration of exposures may be increased. For treatment of sunburn see FIRST AID. Also see BOATS AND BOATING; CANOEING; DROWNING; LIFESAVING SERVICE.

**Safety in Winter Sports.** One of the most exciting of winter sports is sled coasting. In many places safe coasting has become difficult because of heavy automobile traffic. Only hills free from traffic or streets that police have roped off for sliding should be used. Coasters should follow traffic rules, keeping to the right while going up or down the hill. They should be careful of the safety of others at all times.

Ice skating is another healthful winter sport. It is wise to skate only on supervised rinks where it is known that the ice is safe. Those who skate on ponds, lakes, or rivers should have ropes or planks ready to assist a person who may fall through the ice.

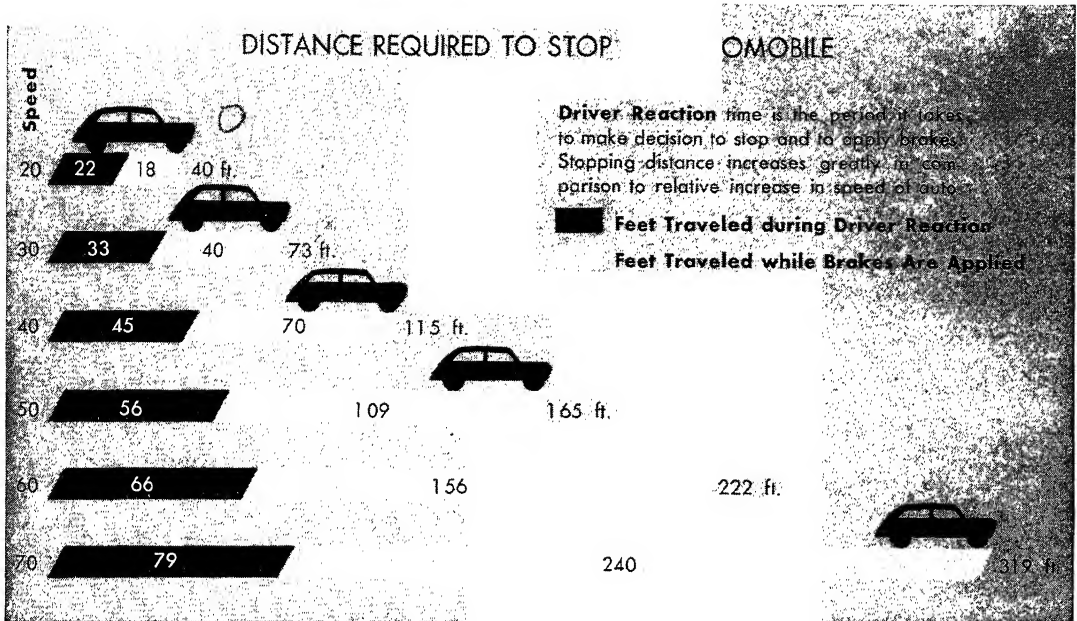
There has been a revival of interest in skiing in the United States. Each week end during the snow season, "ski trains" take great crowds from near-by cities to northern hills and mountains for this sport. Skiers should always look over unknown slopes before trying them. They should ski cautiously when there is a light snowfall or a crust. Ski poles should not be carried across the front of the body, and beginners should have the heel straps open so that in case of a fall the shoes will slip easily out of the skis.

Snowballing is great sport, but hard snowballs are dangerous missiles. They should be used only for distance or target-throwing contests.

**Safe Use of Firearms.** A surprisingly large number of persons (approximately 2,400) are killed each year as the result of firearms accidents. Like drownings, accidents from this cause are most numerous among young persons of high-school age. How often do we read, "I didn't know it was loaded," as an excuse for an accidental shooting! A safe rule to follow is never to point a gun at anyone, even if you think it is unloaded. Firearms should always be unloaded before they are put away and should be kept out of the reach of little children. When carrying a gun, its muzzle should be pointed upward or downward, never toward another person. When climbing through a fence with a gun, the gun should be put through first, muzzle forward. Before one shoots in the open he should take every precaution for the safety of others. A person should wear a red cap or red handkerchief on his head when he is walking through the woods during the hunting season.

#### Safety on the Street and Highway

The automobile is the greatest single cause of accidental injury. The highest number of deaths recorded from motor-vehicle traffic in the United States was in 1941, when 40,000 persons died from this cause.



**Precautions for Pedestrians.** Many persons killed or injured in traffic accidents are pedestrians, and frequently the pedestrian is to blame. Many such accidents could be avoided if persons followed certain common-sense precautions in walking. One should always cross streets at intersections or at designated crosswalks in other parts of the street, and he should look left and then right before starting to cross the street. At intersections where there are traffic officers or lights, he should obey them. Pedestrians should cross streets at right angles and be on the alert for cars about to make turns at intersections. If a person becomes confused when crossing the street, he should avoid sudden moves. He should exercise great care when stepping out from between parked cars and should never stand or play in the street.

**Precautions for Streetcar, Bus, and Automobile Riders.** A passenger waiting to board a streetcar or bus should wait in the safety zone or on the curb. In a safety zone, he should face oncoming traffic. After alighting from a streetcar, he should stay in the safety zone until it is safe to cross to the curb. He should be especially careful about crossing in front of or behind the vehicle from which he has alighted. Entering or alighting from an automobile should be done from the curb side. When riding in a streetcar or motor vehicle, the passenger should keep his arms inside. No one should talk to the motorman or bus driver, as this may distract his attention and cause an accident.

**Precautions for Children Using Roller Skates and Wheel Toys.** Children should use roller skates, wagons, tricycles, pushmobiles, and the like only on sidewalks, or on streets officially closed to traffic. They should watch out for cars backing out of driveways and should be courteous to other users of the sidewalk. Roller skates should be removed before crossing a busy street or before going up or down stairs. One should never

carry sharp objects or glass bottles when skating or riding.

**Precautions for Bicycle Riders.** Where bicycle paths are not provided, it is necessary for cyclists to share the streets and highways with automobiles or to remain on the sidewalk. This means that cyclists must know and follow the traffic rules if they are to avoid accidents. They should keep to the right near the curb, use hand signals, carry head and tail lights when riding at night, obey traffic lights, signs, and officers, and keep their bicycles in good repair. They should not ride in heavy traffic; nor should they ever "hitch" a ride on a streetcar or automobile, or carry another person on the frame, or perform stunts in traffic.

**Precautions for Drivers of Automobiles.** There are so many things that drivers of today need to know if they are to operate their automobiles safely that many schools have introduced full-semester courses in this subject. Among the topics with which all drivers should be familiar are: the traffic laws; proper attitudes; their own physical and mental make-up; how to drive under all types of conditions; and a knowledge of what pedestrians and other drivers are likely to do. To acquire all these skills and this information requires long and concentrated study and practice. Yet the hazards on streets and highways are so great that society has the right to expect all drivers to undergo this training.

#### Safety in Other Means of Transportation

Greater strides in safety have been made in other forms of transportation than in motor vehicle travel. For many years, railroads have been stressing safety and improving equipment and service until riding on a train is now probably the safest form of travel. Very few passengers or employees are killed. Most railroad fatalities occur to motorists at grade crossings and to those trespassing upon railroad property. There still remain,

however, many things that railroads could do to improve safety. More elevated street and highway crossings and more automatic control of trains and switching are among the most important of these.

Ships are now a relatively safe means of transportation. They are equipped with a great variety of safety devices, and crews are well-trained for all emergencies. The United States Government inspects ships regularly and the Lighthouse Service and the Coast Guard do much to insure safety.

Aviation is not so dangerous as many persons consider it. Here too, passengers are relatively safe, thanks to the great strides made in the industry and to the regulations imposed and assistance given by the United States Government.

### Safety in Industry

One of the most inspiring gains in the whole safety movement has been the remarkable reduction in occupational accidents. There are many causes for this improvement. Chief among them has been the installation of guards on machines. Saws, gears, belts, and emery wheels all are equipped with safety devices.

Another factor has been the development of safety clothing. In a modern factory one is likely to see men wearing helmets, gas masks, goggles, heat-resisting gloves, leggings, and safety shoes.

Lighting has been greatly improved and exhaust systems have been installed to draw off dust and poisonous fumes. Good housekeeping shows up everywhere. "A place for everything and everything in its place" is the motto of the modern factory.

Finally, safety instruction has become a regular part of the working day. It is not unusual to shut down the machinery of a great plant to hold a safety meeting. Workers are taught safe methods by means of posters, motion pictures, and lectures. To make certain that lessons have been well learned, safety inspectors are constantly on the job. Industry has maintained its safety program for humanitarian reasons and because it has learned that safety pays.

J.J.F.

See also AIRPLANE (illustration, Safety Aids); AUTOMOBILE DRIVING (Rules of the Road; Safe Driving); COAST GUARD; DUST EXPLOSION; LIGHTING (Effects of Good and Bad Lighting); NATIONAL SAFETY COUNCIL.

### Books for Younger Readers

BUCKLEY, HORACE MANN, and others. *Road to Safety*. 8 vol. American Book, 1942-43. Series of eight safety readers, preprimer through Grade 6.

COLE, NORMAN BROWN, and ERNST, C. H. *First Aid for Boys; Manual for Boy Scouts and for Others Interested in Prompt Help for the Injured and the Sick*. Appleton-Century, 1942.

GOULD, DOROTHEA. *Very First Aid*. Oxford, 1942. Manual for 9-10-year-olds which can be used by them without adult assistance.

LEAF, MUNRO. *Safety Can be Fun*. Stokes, 1938. Cartoon-like drawings illustrate stories of the "Nitwits" who disregard rules of safety.

WILLIAMS, SIDNEY JAMES, and CHARTERS, W. W. *Safety*. Macmillan, 1941. All phases of safety education are included in this guidebook for teen-age readers.

### Books for Older Readers

American Red Cross. *First Aid Textbook, Prepared for the Instruction of First Aid Classes*. Official handbook of

the American National Red Cross. Blakiston, 1945. ARMSTRONG, DONALD BUDD, and HALLOCK, G. T. *What to Do till the Doctor Comes; what to Have Ready in the Home, and How to Deal with Sudden Illness, Accidental Injury or War Catastrophe; a Home Manual for Emergencies*. Simon & Schuster, 1943.

CLEMENSEN, JESSIE WILLIAMS. *Your Health and Safety*. rev. ed. Harcourt, 1946. Safety education for the adult.

EVANS, WILLIAM ARTHUR. *Safety, Your Problem and Mine*. Lyons, 1938. The individual is responsible for both his own safety and that of others.

MARBLE, PRISCILLA R. *Home Safety*. American Book, 1940. *Automobile Safety*. 1940. How to prevent accidents in the home and on the street.

NATIONAL SAFETY COUNCIL, INCORPORATED. *Safer Home Living*. The Council, 1945.

### Outline

- I. Man's Struggle for Safety
- II. Safety at Home
  - A. Prevention of Falls
  - B. Prevention of Burns and Scalds
  - C. Prevention of Poisoning
  - D. Prevention of Asphyxiation
  - E. Prevention of Cuts and Scratches
  - F. Safe Use of Electricity
  - G. Other Home Hazards
- III. Safety at School
  - A. Gymnasiums and Athletic Fields
  - B. Corridors and Stairs
  - C. Classrooms
  - D. Shops and Laboratories
  - E. School Grounds
- IV. Safety Instruction in the Classroom
  - A. School Safety Councils
    1. Safety patrols
    2. School-bus patrols
    3. Other safety organizations
- V. Safety in Outdoor Recreation
  - A. Safety on the Playground
  - B. Safety while Hiking
  - C. Safety in the Water
  - D. Safety in Winter Sports
  - E. Safe Use of Firearms
- VI. Safety on the Street and Highway
  - A. Precautions for Pedestrians
  - B. Precautions for Streetcar, Bus, and Automobile Riders
  - C. Precautions for Children Using Roller Skates and Wheel Toys
  - D. Precautions for Bicycle Riders
  - E. Precautions for Drivers of Automobiles
- VII. Safety in Other Means of Transportation
- VIII. Safety in Industry

### Questions

Is mankind safer since natural dangers have decreased?

What proportion of injuries and deaths occur in the home? What is the most common cause of home accidents?

How are most good electrical wiring and appliances marked?

Where do most school accidents occur?

Where do accidents commonly occur on playgrounds? How can such accidents be avoided?

Why can kite flying be dangerous? What rules should the kite flier observe?

What rules should swimmers observe?

What is the best way to get a sun tan?

About how many persons are accidentally killed by firearms in the United States every year?

What safety cautions should be observed by hunters?

What is the safe way to get on or off a streetcar?

**SAFETY BICYCLE.** See BICYCLE (Bicycle Age).

**SAFETY COUNCIL, NATIONAL.** See NATIONAL SAFETY COUNCIL.

**SAFETY DEVICES.** See AIRPLANE (Instruments and Safety Devices); SAFETY.

**SAFETY GLASS.** See GLASS (Laminated, or Safety Glass).

**SAFETY LAMP** is a lamp designed to protect coal miners from explosions of firedamp, a gas formed by rotting coal or carbon. All types of safety lamps are based on the principle invented by the English chemist, Sir Humphry Davy. There was an attempt to make a safety

lamp in 1813, but Davy invented the first really successful lamp in 1815. It is an oil lamp surrounded by a cylinder of wire gauze of fine mesh, which forms a sort of cage around the flame. The presence of firedamp can be discovered by lowering the wick on the lamp. This causes a pale blue flame about the central flame of the lamp. A careful miner who observes the pale blue flame will leave the spot immediately.

The heat of the flame will not pass beyond the gauze covering and light the gas on the outside until the wire becomes as hot as the flame. The wire has good conducting power and will not become as hot as the flame before the miner has time to get away from the dangerous place. Explosions of firedamp are very destructive.

Safety lamps are usually locked so that miners can not open them. Some lamps go out when they are opened. W.R.LAP.

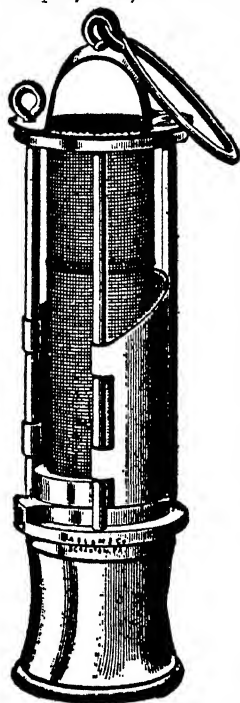
See also COAL (illustration, Safety Devices); DAMP; DAVY, SIR HUMPHRY.

**SAFETY MATCH.** See MATCH.

**SAFETY PATROL, SCHOOL.** See SAFETY (Safety Patrols).

**SAFETY PIN.** See PIN.

**SAFETY VALVE** is attached to a steam boiler to release some of the steam if the pressure becomes higher than the boiler can safely stand. It consists of a cone-shaped vent into which a plug is fitted. This plug is held in place by a lever bearing a weight. By shifting the weight along the lever, a greater or less pressure of steam can be contained in the boiler. In many modern safety valves a spring takes the place of a weight, because a spring is less subject to accident. This is called the pop safety valve. The tension of the spring can be regulated so that the valve will "pop" at any desired pressure, within suitable limits. E.A.Fe.



W. M. Welch Mfg. Co.

**The Wire Mesh** around the miner's safety lamp prevents it from igniting inflammable gases that may surround it.



U.S.D.A.

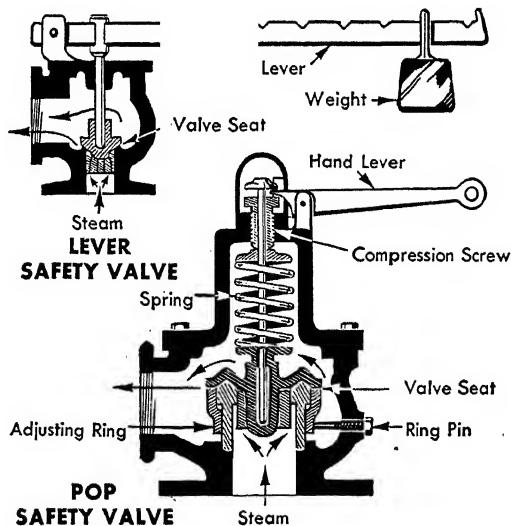
**The Safflower of Europe and Asia Is Used to Make Dye**

**SAFFLOWER** is a plant with large orange heads of flowers that are used in making dyes. The safflower is grown in Europe and Asia and is not found anywhere in North or South America. The plant is about three feet tall and is known as an *herb* because it has a soft non-woody stem. It is an *annual* because the plant lives for only one year and new seeds must be planted each year. Each flower head is made up of many small flowers that are shaped like tubes. The leaves of the safflower are broad and have spines in the middle.

Safflower dye is made from the dried flowers and is used in dyeing silks and cottons. It is often used as a substitute for another herb called *saffron*, and is therefore known as *false saffron*. See also SAFFRON. H.N.M.

**Classification.** The safflower belongs to the family *Carduaceae*. The species is *Carthamus tinctorius*.

**SAFFRON, SAF run,** is a brilliant yellow dye and a food flavoring. It is produced by drying the stigmas and



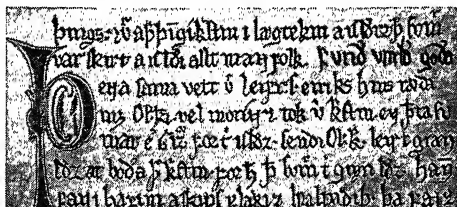
part of the styles of the purple autumn crocus. About four thousand flowers yield about one ounce of commercial saffron. The product smells sweet, but has a bitter taste. It is used in cooking, and in flavoring and coloring candy. In Europe and India, saffron is widely used to season foods. See also CROCUS. L.R.C.

**SAFID RUD**, sah FEED rood, **RIVER**. See IRAN (Rivers, Lakes, and Bays).

**SAGA**, SAH gah, or SA gah, is the name given the early stories of Icelandic or Scandinavian heroes. Sagas may be historical, mythical, or romantic. Any story of heroic deeds that resembles these early tales may be called a saga. There are sagas of the seas, and American sagas of many kinds.

The original Icelandic sagas, such as the ones of *Grettir the Strong* or of *Frithjof*, tell stories of the great national heroes and rulers. They are composed according to very strict rules. A typical saga traces the life of its hero from his birth to his death. If he died by violence, it may include an account of the vengeance his family took for his death. The story uses much alliteration, or repetition of the same first letters in words and the same sounds in phrases.

Icelandic sagas were first told orally. They were recited at banquets or other festive gatherings, and were important entertainment for the long northern nights.



Specimen Page of a Saga Manuscript

By the 1300's, literary men saw the value of these tales and began to write them down. Most of them were written in the 1400's.

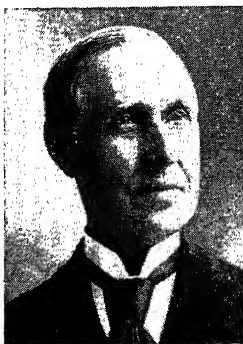
The greatest of these compositions is the *Njalssaga*, the saga of law. There are also the *Eyrbyggjasaga* and the *Volsunga saga*, famous epics in prose form. Some of the authors are known, but there is no clue as to who many of them were. T.P.C.

**SAGE** is a somewhat shrubby garden plant which is known for its sweet odor and the flavor of its leaves and stems. The sage belongs to the mint family. It came from the southern part of Europe, and is grown in home gardens throughout North America. The sage is from six to fifteen inches in height. It has rough, woolly, grayish-green leaves, and a white, woolly stem. The flowers may be blue, white, or purple. They grow in groups. The sage is reproduced by seeds or by planting slips or cuttings. It needs much sun and a rich soil to grow properly. The leaves and stems of the sage are used in making seasonings for sausages and cheeses, dressings for meat, and sauces. H.N.M.

**Classification.** Sage belongs to the family *Lamiaceae* (or *Labiatae*). The botanical name of garden sage is *Salvia officinalis*. There are several other species, both wild and cultivated.

**SAGE, RUSSELL AND MARGARET OLIVIA SLOCUM**, were an American financier and his wife.

**Russell Sage** (1816-1906), was born in Oneida County, New York. He was a farm boy until he was twelve, when he went to work in a grocery store. He soon built up his own wholesale grocery business, and in 1852 was



Brown Bros.

**Russell Sage**, American banker whose money was used for many philanthropies.

electd to Congress. He served for two terms. Shortly after leaving Congress, Sage met Jay Gould, the great railway promoter. (See GOULD.) Sage joined Gould in his railway-promotion projects and made a large fortune in such activities and in stock manipulations. At his death, he left about \$63,000,000 to his wife.

**Margaret Olivia Slocum Sage** (1828-1918), was Russell Sage's second wife. She was born at Syracuse, N.Y., and attended Troy (N.Y.) Female Seminary. She married Sage in 1879. After her husband's death, she used

her fortune in many projects. The largest of these was the Russell Sage Foundation, which she established with a gift of \$10,000,000 in 1907. She also gave to missions, to hospitals, to museums, and to other religious and educational enterprises. By her will she gave money to eighteen different colleges, including Russell Sage College. H.U.F.

See also RUSSELL SAGE COLLEGE; RUSSELL SAGE FOUNDATION.

**SAGEBRUSH** is a bushy plant which is known for its sweet odor and bitter taste. The sagebrush grows in the dry plains of the western part of the United States. It may grow to any height from two to twelve feet, and has a straight stiff stem. The leaves are small and grow very close together. The flowers of the sagebrush grow at the top of the stem and may be yellow or white. Each flower is made up of many tiny flowers called florets.



J. Horace McFarland

**The Tangy-smelling Sage Plant** has been used for centuries to improve the taste of food. Chopped or powdered sage is often used in sausage and in dressings for meat, fowl, and fish.



The sagebrush is a perennial. It grows best in the dry soil of the western plains, where many other plants could not grow. Sometimes the heat and dryness in the summer dries up the plant so much that it shows no sign of being alive. Then when the wind blows, the sagebrush is often pulled out of the ground and is blown all over the plains much as tumbleweed is blown. Its seeds are scattered in this way. Often the sagebrush is the only type of plant life that can be found for hundreds and hundreds of miles.

There are several types of sagebrush. Some of the plants are used as food for sheep in the winter. In some places, sagebrush is also used for fuel. J.J.L.

See also FLOWER (color plate, Desert Flowers).

**Classification.** Sagebrush belongs to the genus *Artemisia* and the composite family, the *Compositae*. The common sagebrush is *Artemisia tridentata*.

**SAGEBRUSH STATE.** See NEVADA.

**SAGE GROUSE.** See GROUSE.

**SAGE OF MONTICELLO.** See JEFFERSON, THOMAS (Later Life).

**SAGHALIEN, SAH gah LYEN, or SAKHALIN.** See SAKHALIN.

**SAGINAW, Mich.** (population 82,794), is a manufacturing city with nearly 150 industries. Saginaw lies along both banks of the Saginaw River, about eighty-five miles northwest of Detroit. The city is about twenty miles south of Saginaw Bay.

**Industry and Trade.** Farms near Saginaw produce large crops of sugar beets, which are shipped from the city for processing in Bay City and in Saint Louis. The mining of soft coal was once an important industry in this region, but has declined in recent years. Saginaw factories make automobile parts, furniture, railway equipment, graphite products, measuring instruments, boilers, Venetian blinds, and machinery. Saginaw once had large sawmills but most of them were closed after the commercially valuable Michigan forests were cut down.

Large ships can sail down the Saginaw River from the city to the mouth of Saginaw Bay. Several railway and bus lines operate out of the city.

**History and Government.** A settlement called Saginaw City was founded on the west bank of the river following the building of Fort Saginaw in 1819. In 1849 a second settlement, which came to be called East Saginaw, was made on the opposite bank. The two were united as Saginaw in 1889. In 1936 a city-manager form of government was adopted. Saginaw is the seat of government of Saginaw County. The city is the home of the Michigan Employment Institution. L.G.V.V.

**SAGINAW, SAG ih naw, BAY.** See SAGINAW.

**SAGITTARIUS, SAJ ih TA ri uh,** is a constellation, or group of stars, in the zodiac, which is the circular path of the sun as it appears to go around the earth. Sagittarius is the ninth sign of the zodiac. The sun enters Sagittarius on or about November 22. In ancient Greek, the name *Sagittarius* means *The Archer*.

Sagittarius is made up of a group of stars in the southern part of the sky. It is south of Aquila, which is a constellation in the Milky Way. Sagittarius has no brilliant stars. But it has interesting groups of stars that are known as variables, because they change in their bright-



The Constellation of Sagittarius, the Archer

ness. The densest part of the Milky Way is found in some of the star clouds in Sagittarius. C.F.

See also ZODIAC.

**SAGO, SA goh,** is a starch found in the spongy center, or pith, of various tropical palm trees. A type of flour, called sago flour, is made from sago. The largest supply of sago comes from the East Indies. Sago is like arrowroot, cornstarch, and tapioca in its composition and uses. Large quantities of sago are sent to Europe and North America for cooking purposes. Sago flour is used mostly in making puddings and as a thickening for soups. The flour is very healthful, and it is easily digested. Sago is one of the principal foods of the natives of the East Indies.

The fruit of the palm trees from which sago is produced is not allowed to ripen fully. The full ripening completes the life cycle of the tree and exhausts the starch center. It leaves the trunk a hollow shell and causes the tree to die. The palms are cut down by the natives when they are about fifteen years old, at which time they are just ready to flower. The stems, which grow to a height of thirty feet, are split up. The starch pith is taken from the stems and ground to a powder. A single palm yields about 800 pounds of starch. The powder is kneaded in water over a cloth or sieve. It passes into a trough where it settles. After a few washings, the sago flour is ready to be used by the natives in making cakes and soups. Sago is further refined when it is prepared for export purposes. L.R.C.

See also ARROWROOT; CORNSTARCH; TAPIOCA.

**SAGUARO.** See CACTUS (Kinds of Cacti); FLOWER (color plate, Desert Flowers [Giant Cactus]).

**SAGUARO,** a national monument. See NATIONAL MONUMENT.

**SAGUARO FOREST.** See ARIZONA (State and National Parks and Forests).

**SAGUENAY, sag eh NA, RIVER** is an important waterway in the Canadian province of Quebec. It is a branch of the Saint Lawrence River. The Saguenay is a deep, dark stream. It is world-famous for its scenery, especially in its lower course. The Saguenay begins at the eastern end of Lake Saint John, and flows in an easterly direction into the Saint Lawrence. Its mouth is 120 miles

northeast of the city of Quebec. There is a series of rapids and falls in the river for a distance of almost forty miles below Lake Saint John. Only canoes can sail the rapids and falls. At Chicoutimi, the river can be used by small steamers, and six miles farther down, it can be sailed on by larger ships. From Chicoutimi to the mouth of the river, a distance of sixty miles, the Saguenay flows through a rocky gorge. Its walls gradually rise to a height of 1,800 feet at the Saint Lawrence. The Lower Saguenay is really a bay or inlet rather than a river. It is from three quarters of a mile to two miles wide, and ranges from 800 to 2,000 feet deep. The Peribonka, which is a branch of Lake Saint John, is generally considered as the upper course of the Saguenay. L.D., JR.

**SAHAPTIN**, *sah HAP tin*. See INDIAN, AMERICAN (Languages, Signs, and Smoke Signals; Table of Tribes).

**SAHARA**. This desert is the largest in the world. It stretches across the northern part of Africa and extends eastward into the continent of Asia. Only a narrow strip of fertile land along the Nile River and scattered places where palms and grasses grow, or *oases*, break up this vast desert land.

The Sahara is larger than the whole United States. It covers about 3,500,000 square miles. The greatest length of the desert, from east to west, is about 3,200 miles, which is greater than the distance between New York City and San Francisco, Calif. The Sahara is from 800 to 1,400 miles wide.

The Sahara Desert makes up the greater part of French West Africa, and parts of Libya, Egypt, and the Anglo-Egyptian Sudan. The Sahara begins again east of the Red Sea and covers a large part of Arabia.

Most of the Sahara is just mile upon mile of hot, shifting sand dunes. There are, however, great stretches of land where the surface of the desert is hard and rocky. A central plateau extends about three fourths of the distance across the desert from northeast to southwest. This plateau is from 1,900 to 2,500 feet above sea level. Three mountain ranges, the Ahaggar, the Tibesti, and the Aïr, rise above this plateau. The highest peaks are from 6,000 to over 9,000 feet above sea level. In this mountain region there are many fertile river valleys. The Western Sahara is a vast sand waste. So is the Libyan Desert, north and east of the central plateau. A little more plant life exists in the Arabian Desert, the Asiatic

part of the Sahara which lies east of the Red Sea.

**Climate**. The northeast trade wind which blows constantly across Africa from the Red Sea to the Atlantic dries up the moisture of the Sahara. In summer the equatorial sun often brings the temperature to between 120° F. and 130° F. during the day. In winter, the sand cools so quickly that there may be frost during the night; the desert may actually become chilly when the wind becomes cutting and cold. But it seldom snows in the lower areas of the desert, although the higher mountains are sometimes snow-covered.

There is no part of the Sahara that does not get some rain, but in many places there are only a few scanty showers. Sometimes rain falls through the air but evaporates before it strikes the ground. Blinding sandstorms are common throughout the Sahara.

**Oases**. An oasis is a watered spot in the desert. There are many of these areas in the Sahara. They range in size from less than a square mile to those so large that several million date palms may be grown by the use of irrigation. Most of the oases are watered by springs that are fed from underground water. This water collects on a layer of clay beneath the sand. Some of the oases have been made large by the digging of new wells, and the soil has been made fertile enough to grow tropical fruits and grain.

**Animal Life** is scarce on the Sahara, because of the small natural food supply. The camel and the ostrich find a natural environment in the sandy wastes. On the borders of the desert, where there is some water, there are lions, panthers, hyenas, jackals, foxes, and several kinds of apes. There are many snakes, including the huge python.

**The People of the Sahara** include Arabs, Moors, or Berbers, Tuaregs, Bedouins, Tibbus, Negroes, and Jews. All of them have fitted their ways of life to the desert. The Arabs live along the northern border of the desert. The Moors make their home in the western region. Berbers live along the fringes of the Sahara along the Mediterranean coast of Africa. Tuareg robber bands wander over various parts of the Sahara. The Bedouins are wandering shepherds and herdsmen. On the southern edge of the desert live the Tibbus, of mixed Negro stock, and the true Negroes who have come up from the interior of Africa.

**Industry and Trade**. Camel caravans were crossing the northern edge of the Sahara Desert long before the Europeans came to Africa. But thirst and starvation threatened those who attempted to cross the desert from north to south until the motor truck was developed. In 1923 the French government sent caterpillar tractors across the width of the Sahara for the first time. Today, motor-buses and trucks make regular trips across the Sahara in all directions. Modern filling stations are situated at many of the oases, near the springs where camels still stop to drink and rest. The wireless telegraph provides communication across the great expanse of sand. The French government has laid plans for a Trans-Saharan Railway to make crossing the desert even more convenient.

Many persons believe the Sahara has a great industrial future. Natural resources which have already been discovered in the rocky regions of the Sahara include

**A Life-giving Water Hole in the Sahara** is surrounded by a low wall, or coping, made of gypsum, to keep the shifting sands out of it. Such wells are sometimes 20 feet deep.

Ewing Galloway







**This Unusual Picture of the Sahara** shows the endless waves of shifting sand dunes. It is a bleak region without vege-

tation and with but little animal life. The Berber tribesmen and their camels are on the way to Algiers.

Ewing Galloway

coal, oil, and rich beds of phosphate. E.D.W.

See also CAMEL; DESERT; KHAMISIN; LIBYAN DESERT; OASIS; SIMOOM; SIROCCO.

**SAID PASHA** (1822-1863). See LESSEPS, FERDINAND VICOMTE DE.

**SAIGON**, *sy* GOHN. See FRENCH INDO-CHINA (Cochin China).

**SAIL**, in commerce and transportation. See SAILING SHIP; TRANSPORTATION (Travel on Water; Transportation in the United States).

**SAILFISH** is a large fish living in all warm oceans, and has a large dorsal fin that spreads out like a sail. Sport fishermen catch these fighting gamy fishes on light rod-and-reel tackle in the warm ocean waters off both coasts of the United States, and Central and South America. Sailfish around Florida are sometimes six feet long and weigh as much as 120 pounds. The largest caught in our Pacific waters weighed 182 pounds. Their flesh is good to eat, but there are not enough of them to be commercially important. The upper jaw of the sailfish is sharp and long like that of the swordfish, to which it is related. L.P.Sc.

See also FISH (color plate, Salt-Water Fish).

**Classification.** Sailfish belong to the family *Istiophoridae*. The Atlantic sailfish is *Istiophorus americanus*, and the Pacific, *Istiophorus greyi*. The sailfish is sometimes called a billfish.

**SAILING.** Any boat can be sailed to *leeward*, or in the same direction as the wind. This is done simply by spreading any fabric that will catch the wind and act as a sail. This is the way early man learned to sail. He probably used a fallen tree as a boat and an animal skin or a mat of woven rushes as a sail. He could sail only in the direction the wind was blowing. He could return only when the wind changed, or by using oars or paddles. For thousands of years, man made no real

progress beyond this simple, one-way sailing, called sailing to *leeward*, or with the wind.

Sailing a boat against the wind, or to *windward*, probably started somewhere in the Orient. This way of sailing was brought to Europe by the Arabs, who first used the fore-and-aft rig. In the earlier square rig the sails were hung from yards, or crosspieces on a mast. The fore-and-aft rig had triangular sails which were spread from the mast lengthwise to the ship. This change in rig was a great advance in sailing ships to windward.

Later changes in the design of ships, which made them easier to propel forward but harder to drive sideways, made it possible to make good progress within forty-five degrees of the wind's direction.

It is easy to see that no ship can be sailed directly against the force that is driving it. But if she can be sailed toward the wind, turned, and sailed in another direction, but still toward the wind, she will soon sail to a given point. Thus, in Fig. 1, if a vessel at point A wants to sail to point B, she might be sailed along any number of courses. She might go from A to C to D to E to F

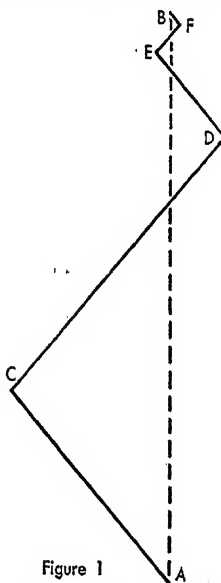


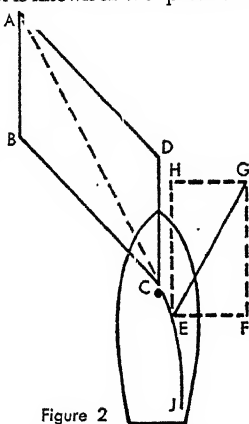
Figure 1

to B. This is known as *tacking*, and is the only way a vessel can be sailed against the wind.

To know why the wind does not blow a boat directly

to leeward, we must analyze the wind and its effect on a sail. This we do by what is known as the "parallelogram of forces." Let us say the wind in Fig. 2 is blowing in the direction of the line  $BC$ . Now, the boat in going ahead is making some wind of her own, just by sailing through the air as well as through the water. Let us say that the wind the boat makes blows along the line  $DC$ . If the length of the line  $BC$  shows the strength of the true wind, then the length of the line  $DC$  shows the strength of the wind the boat makes. Now draw  $BA$  parallel to  $CD$  and  $DA$  parallel to  $CB$ . Then the line  $AC$  shows the combination of the two winds, or the "apparent wind," as it is called. It is this apparent wind that drives the boat.

Figure 2



The wind blowing over the top of an airplane wing gives a lift upward. So also, the wind blowing past the lee side of the sail  $CJ$  pushes on the sail in a direction somewhat like the line  $EG$ , and not directly to leeward. Many factors enter into this, so that it may not be entirely accurate. It varies with different sails and different ships and much is still unknown. But the line  $EG$  does lead forward. By drawing lines in the same way as before, we find that the line  $EG$  can be broken into two forces. Either  $EH$  or  $FG$  represent that part of the force  $EG$  which drives the boat ahead. Also, either  $EF$  or  $HG$  represent that part of the force  $EG$  which drives the boat sidewise.

The hull, or body, of a boat is planned to offer the smallest resistance to forward motion. Through its general shape, its keel, and underwater parts, it offers the greatest possible resistance to sidewise motion.

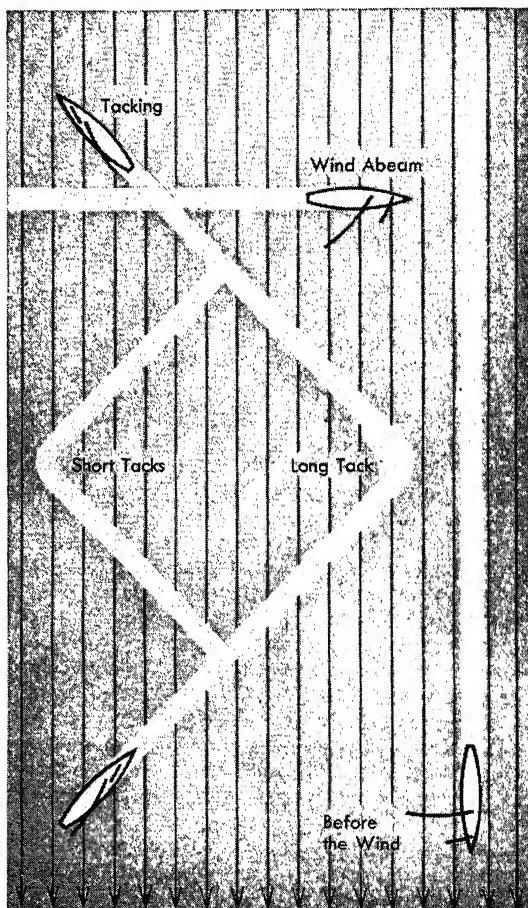
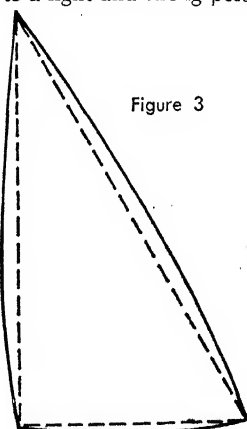
To stop a boat under sail, adjust the sheets or turn the boat so that the wind blows on both sides of the sail. If the boat is headed into the wind, she will stop in a short distance.

**Making a Sailboat.** No boat is a good sailboat unless she has been planned and built for the purpose of sailing. But a rowboat, a punt, or any other small flat-bottomed boat can be made into a sailboat with some success. Get a strong, light pole as a mast and fasten it upright in the boat. Secure it at the bottom by inserting it into a hole in a block of wood securely fastened to the inside bottom. Fasten a plank across the boat to support the mast and make a hole in it for the mast to pass through. You can not make these too strong, since the strain is very great. The sail should be fastened to hoops on the mast, and hoisted by a line running through a pulley or block at the top of the mast and down to the boat. Cut the edges of the sail along a slightly outward curve. See Fig. 3. When these curves are pulled straight, the sail will have the proper curve. The edge of the sail attached to the mast, called the *luff*, should be nearly one and a half times the length of the boat. The bottom edge of the sail, called the

*foot*, should be about two thirds the length of the boat. The foot should be fastened to a light and strong pole known as a *boom*. The easiest way to do this is to lace the sail on. The boom should be fitted with jaws, or a hoop, so it can be turned around the mast. The mast should be located so that the center of the area of the sail will be a little forward of the center of the boat.

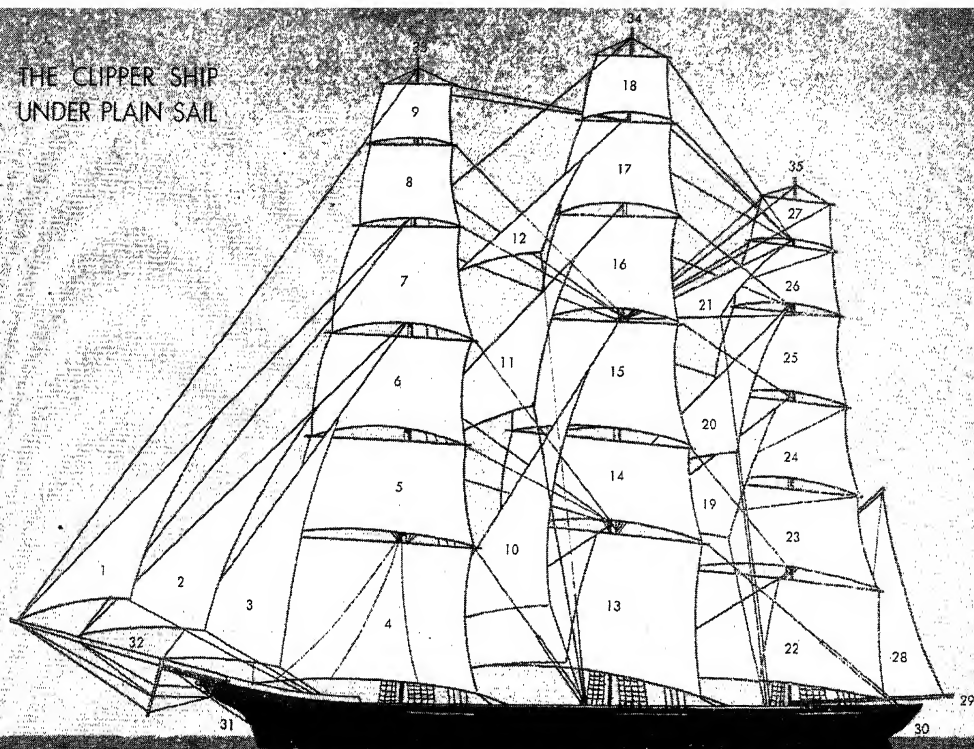
The boat should have some means of *lateral resistance*, that is, it should have something to keep it from being blown sidewise. The best thing for this is a *keel*, or timber built lengthwise under the center of the

Figure 3



**Wind Direction** is indicated by the long arrows. When a boat sails with the wind abeam, it moves at approximate right angles to the direction of the wind. The breeze blows from directly behind the boat when it sails before the wind. In tacking, the boat sails toward the direction of the wind in a series of long or short zigzags.

## THE CLIPPER SHIP UNDER PLAIN SAIL



- |                         |                             |                               |               |
|-------------------------|-----------------------------|-------------------------------|---------------|
| 1 Flying Jib            | 10 Main-topmast Staysail    | 19 Mizzen-topmast Staysail    | 28 Spanker    |
| 2 Jib                   | 11 Main-toppallant Staysail | 20 Mizzen-toppallant Staysail | 29 Boom       |
| 3 Fore-topmast Staysail | 12 Main-royal Staysail      | 21 Mizzen-royal Staysail      | 30 Stern      |
| 4 Foresail              | 13 Mainsail                 | 22 Mizzen Sail                | 31 Bow        |
| 5 Lower Fore-topmast    | 14 Lower Main Topmast       | 23 Lower Mizzen Topmast       | 32 Bowsprit   |
| 6 Upper Fore-topmast    | 15 Upper Main Topmast       | 24 Upper Mizzen Topmast       | 33 Foremast   |
| 7 Fore-toppallant Sail  | 16 Main-toppallant Sail     | 25 Mizzen-toppallant Sail     | 34 Mainmast   |
| 8 Fore-royal            | 17 Main Royal               | 26 Mizzen Royal               | 35 Mizzenmast |
| 9 Fore-skysail          | 18 Main Skysail             | 27 Mizzen Skysail             |               |

boat. The best keel is short and deep. But it is hard for an amateur boatbuilder to build this strong enough, so you may have to be satisfied with a long, shallow keel. It can be built strongly by a good amateur carpenter. It should be not less than eight inches deep and should be as long as possible. Bolt this keel strongly to the boat and be sure that the holes for the bolts are the exact size of the bolts. Plenty of marine glue should be applied around them to prevent leaking. Fasten a rudder and tiller at the stern (see Fig. 4) so that the rudder can be pivoted freely along its forward edge. Fasten a line, called a *sheet*, to the boom so you can trim your sail and adjust its angle to the wind.

See also YACHTING.

**SAILING SHIP.** The oldest sailing ships we know about were used by the Egyptians probably five or six thousand years ago. Clear pictures of ships and even a few model ships with sails have been found in the tombs of Egyptian kings. These models were supposed to be use-

ful to the spirits of the dead, and it seems likely that they were good copies of ships then being used. Some of the models are more than four thousand years old.

Some ships shown in these early pictures and models are rather like our modern sailing ships in that they had the rudder, or steering blade, in the middle of the back of the boat, or stern. Later, bigger steering oars were fastened to one or both sides of the stern of a sailing ship. But rudders did not begin to be used again until about A.D. 1300. The early rudders apparently had not been large enough to work efficiently.

### Sails

The early ship pictures on coins, vases, and other objects show that nearly all ships before the time of Christ had one large, oblong sail. The sail was hung from a yard, or crosspiece, fastened by its middle to a mast either in the center of a vessel or in the forward part. Egyptian ships usually had a wooden boom fastened to the foot of the sail, which was much wider than it was high. Sails were first thought of only as a help to the rowers. The wind was of no use except when it blew from behind and sometimes it did not blow at all. So all vessels had oars, often called sweeps, as their regular form of power.

Three or four hundred years before Christ, a great discovery increased the usefulness of ships. Man found that he could use some of the wind's power to sail

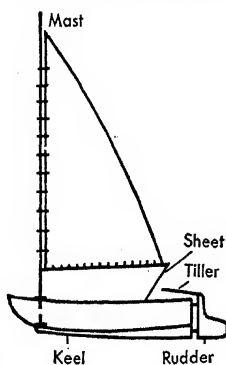


Figure 4

H.A.CAL.

against the wind. This is called tacking. In order to tack well, the boom or yard to which a sail is fastened must be hauled around until it is pointing almost straight ahead. The "leading edge" of the sail has to be kept from shivering as the wind strikes it. This was done at first by tilting up the yard which carried the top of the sail to tighten the edge of the sailcloth. The next step was to make the sail three-cornered instead of square. This was the beginning of the fore-and-aft rig. The triangular sails were called *lateen* sails. For 2,000 years seamen took their choice between square and lateen sails. The square sail was better for ocean travel. The Viking ships used a single square sail to cross the North Atlantic long before the time of Columbus. Lateen sails were favored in the Mediterranean and east of Africa.

Both kinds of sails were used together in the same vessel about the time of the Crusades. Early in the 1400's, the standard sailing ship was worked out. Italian, Spanish, and English shipbuilders all helped to develop the typical vessel which had three masts. The *foremast* was near the forward part of the ship, the *mainmast* was near the middle, and the *mizzenmast* was the mast nearest the stern. The first two carried square sails. The mizzenmast carried a lateen sail. Often a small square sail was fastened below the bowsprit, on a small boom sticking out forward from the bow. This rig was used with little change until shortly before the American Revolution. Then triangular head sails replaced the square sail on the bowsprit, and the lateen sail on the mizzenmast was cut into two pieces. These were called the spanker and the staysail. A vessel with these sails thereafter was what sailors called a ship. It was a three-masted vessel with square sail on all the masts. It also had a fore-and-aft spanker on the mizzenmast, and triangular fore-and-aft staysails or jibs running forward from each of the masts. The square sails gave a ship great power and speed with a favorable wind. The fore-and-aft sails helped with maneuvers such as tacking and steering.

#### Long Ships and Round Ships

As the forms of the sails were changing, the bodies, or *hulls*, of ships were changing also. Here again some of the early shapes seem to have been better than most of those in use for ages afterward. The Romans called their ships either "long" or "round." The long ships were naval vessels and the round ships were built for trade. The "round" ship was not really round. Its length was about twice its breadth across the beam.

The long ships of the ancients were *galleys*, built for rowing. Slaves were chained to benches and beaten to make them work. They provided a surer form of power than the wind. This was so true of fighting galleys that their masts and square sails were replaced by smaller ones when battle was expected. A galley had to be shaped in such a way that its many oars would have room to operate. The *trireme* was a favorite form of galley in ancient Greece. It had an upper, middle, and lower row of oars on each side. Experience brought the galley back to its first form, with all its oars on a single level. Galleys were used as late as the War of 1812. But they had become less important after the great Battle of

Lepanto in 1571, in which about 400 large galleys took part.

The problem of the round ships, or merchant vessels, was different. If such a ship was to carry enough cargo to make money, it could not carry many slaves or food for them. It therefore carried more sail for its weight than did a galley. Speed did not seem important in the old days, when ships anchored for the night and tried to keep in sight of a shore line. Oars took second place to sails only after the combined use of both square-rig and fore-and-aft sails made the wind more useful for a larger part of the time. Shipbuilders gave up the idea of two separate kinds of ships, long and round. They began to work out a single principle of shipbuilding. This was to plan a hull that would have the least possible resistance to forward motion, and the greatest possible resistance to being blown sideways. The old galleys had been made shallow for speed and blew sideways easily. The old blunt and deep merchant ships did not blow sideways easily, but they could not go forward very fast. An idea using the good features of both types was needed. In a few places this idea had been used earlier by great seafaring peoples. The viking ships of the North and the Arab ships of the East had fine underwater lines long before other peoples studied the problem properly. But these vessels were rather small. It was the need for large merchant ships, armed to defend their cargoes, that forced the beginning of serious study of naval building in most countries. (See *GALLEON*.) Out of this study came the *clipper ship* of the middle of the 1800's.

#### The Clipper Ship

The clipper ship, a merchantman, upset an old rule by being faster than the best war vessel that ever sailed under canvas. Even in wartime, the clippers got along without guns because no armed enemy vessel could catch them. The first clippers were American ships, planned to meet the need of a young nation for a ship that could sail anywhere in any weather. The United States merchant marine had to win its position by speedier service, since most of the nations had laws which kept much of the world's trade to themselves. Speed was not important to shippers like the British East India Company, whose trade was protected by their own government.

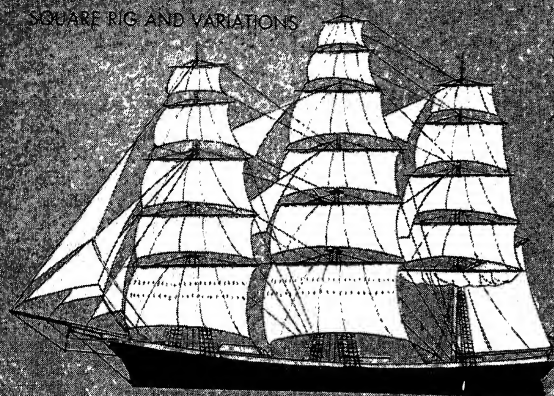
The great navies also relied on gunpower and numbers of line-of-battle ships, rather than upon speed. But speedy *frigates*, a type brought to its highest development in the United States, won the naval battles in the War of 1812. A few years later the Atlantic *packet ships* of the United States began to get the best of the cargo carrying trade. They kept their promise to sail on time, full or empty, and their trips were much faster than those of their rivals.

In the 1840's and the 1850's, a great new generation of naval architects grew up on the northeastern seaboard of the United States. These men knew how to build almost perfect sailing ships. Among them were John W. Griffiths, who built the *Sea Witch* and the *Challenge*, William H. Webb, responsible for the *Flying Dutchman* and the *Young America*, Nathaniel B. Palmer, who planned the *Oriental*, and Samuel Hartt Pook, who

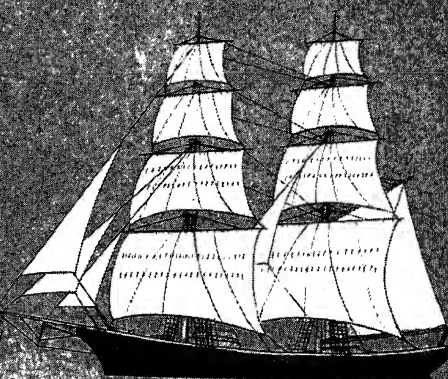


# TYPES OF SAILING VESSELS

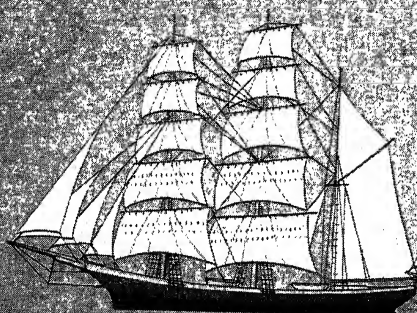
## SQUARE RIG AND VARIATIONS



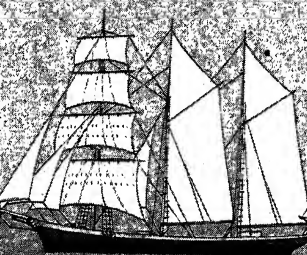
Full-rigged Clipper Ship



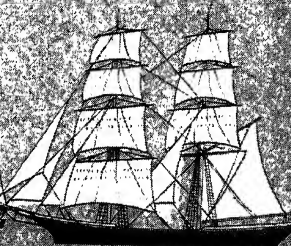
Brig



Bark

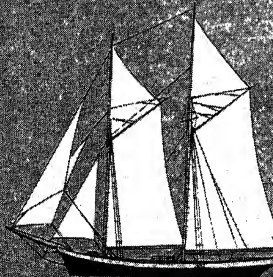


Barkentine

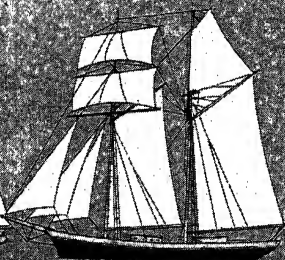


Brigantine

## FORE-AND-AFT RIG

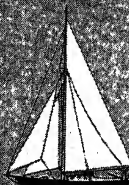


Schooner

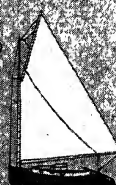


Topsail Schooner

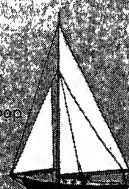
## COMMON RIGS USED ON SAILBOATS



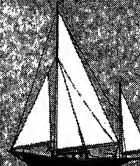
Cutter



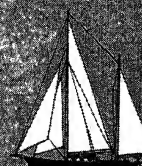
Catboat



Sloop

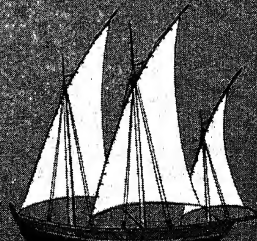
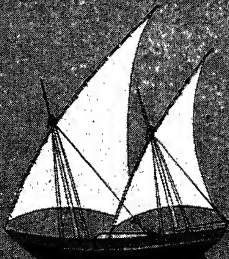
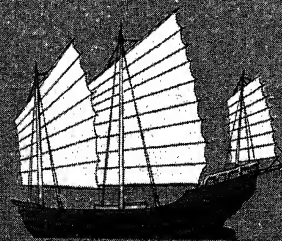
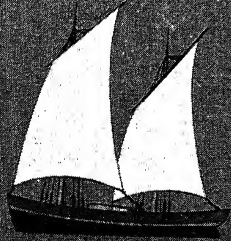


Yawl



Ketch

## UNUSUAL RIGS



drew the lines of the *Surprise* and the *Red Jacket*. The greatest of all was Donald McKay, who built as many first-rate clippers as the rest put together. Some ships, like the *Mayflower*, are famous for historical reasons. But Donald McKay's *Flying Cloud* earned her fame by great voyages. Her name is known throughout the world, even among persons who never saw a sailing vessel. Twice she sailed from New York City, around Cape Horn, to San Francisco in eighty-nine days. No other sailing vessel ever did so well. Once she sailed for twenty-four hours at an average speed of nineteen miles an hour, land measure. Although she was driven mercilessly, she lasted for twenty-three years, and then was lost by accident, not by any failure of her own structure. Other famous McKay clippers were the *Sovereign of the Seas*, the *Lightning*, and the *James Baines*. McKay's *Great Republic*, measuring 4,555 tons, was nearly twice as large as any other wooden sailing ship of its day.

The great days of the American clipper ship ended with the War between the States. But England carried on, building fine, though smaller, clippers for another ten years. After that, sailing ships could make money only in a few trades, and then only if sailed with caution. For nearly all practical purposes, the six thousand years of the sailing ship ended about 1900. A.L.A.

**Related Subjects.** The reader is also referred to:

Caravel	Galley
Clipper Ship	McKay, Donald
Frigate	Sailing
Galleon	Trireme

**SAILOR KING.** See WILLIAM (IV, England).

**SAILOR'S CHOICE.** See GRUNT.

**SAINT** is a person who is *canonized*, or declared to be the lawful object of public veneration as one of God's chosen company, by the sovereign pontiff, or Pope, of the Roman Catholic Church.

The chosen one first must have been *beatified*, or declared blessed by the Pope. The beatification is based on two processes. The first examines the life and writings of the person, or "Servant of God" in question, whose reputation for holiness or martyrdom is looked into, usually by the bishop of the place where he or she lived. The second, called the *Apostolic process*, is begun by the Pope when it looks as if the examination will prove that the person lived a very virtuous life or was a martyr. If the title of "blessed" is conferred, it indicates the belief of the Church that the one thus honored has certainly been admitted by God to the happiness of heaven.

The Congregation of Rites proposes the decree of sainthood to the Pope after it has accepted proof of two miracles following the beatification. Proof of three miracles must be given if the person was not beatified through the ordinary processes.

The canonization is celebrated at Rome in St. Peter's Church, and a service of thanksgiving may also be held in other churches within a given time after the canonization. F.J.S.

See also the list of Saints in the BIOGRAPHY section of the READING AND STUDY GUIDE.

**SAINT, THOMAS** (about 1790). See SEWING MACHINE.

**SAINT ALBANS**, Vt. (population 8,037), is known as

the "Railroad City" because a branch of the Canadian National Railways has headquarters and shops here. The city lies in the northwestern corner of Vermont, about five miles east of Lake Champlain, and about fifteen miles south of the Canadian border. Dairy products, maple sugar, and sugar-making equipment are important products of Saint Albans.

On October 19, 1864, the famous Saint Albans Raid occurred here. This was an attack on the United States by Confederate soldiers from Canada. In June, 1866, Saint Albans was used as a base of operations by the Fenians, an armed organization of Irishmen, in an invasion of Canada. A.W.P.

**ST. AMBROSE COLLEGE** is a liberal arts college for men at Davenport, Iowa. It is controlled by the Catholic diocese of Davenport, but students of all faiths are accepted. Marycrest College for Women is the women's division of St. Ambrose. Courses in both divisions lead to the B.A. and B.S. degrees. St. Ambrose was founded in 1882, and has an average annual enrollment of about 850. L.C.S.

**ST. ANDREWS.** See SCOTLAND (Cities).

**ST. ANDREWS**, New Brunswick (population 1,167). This town is often called "Saint Andrews-by-the-Sea." It lies on Passamaquoddy Bay, about sixty miles west of Saint John, and about five miles east of the United States border. The many small islands in Passamaquoddy Bay and the beautiful ocean shore line make the town a tourist center and summer resort. The town was first settled by the French in the early 1600's. In 1783 a group of United Empire Loyalists settled at St. Andrews. M.J.T.

**SAINT ANDREW'S CROSS.** See CROSS (illustration).

**SAINT ANDREW'S FLAG.** See FLAG (color plate, Flags of British Commonwealth of Nations).

**SAINT ANSELM'S COLLEGE** is a liberal arts school for men at Manchester, N.H. It is operated by the Catholic Benedictines, but students of all faiths are admitted. There are preparatory courses in medicine, dentistry, law, divinity, and teaching, leading to the B.A. degree. The college was founded in 1893, and has an average enrollment of about 280. S.F.P.

**SAINT ANTHONY, FALLS OF.** See MINNEAPOLIS.

**SAINT ANTHONY'S CROSS.** See CROSS (illustration).

**SAINT ANTHONY'S FIRE.** See ERGOT; ERYSIPELAS.

**SAINT AUGUSTINE**, Fla. (population 12,090), is the oldest city in the United States. It was founded by Pedro Menéndez de Avilés in 1565 to protect the Spanish empire in North America from French colonizers. Today, Saint Augustine is a winter resort because of its fine climate. It lies on the Atlantic Coast in the northeastern part of Florida. Industries in the city include railway shops and shrimp fisheries.

Saint Augustine was the center of the east Florida settlement under both Spain and England. After Florida joined the United States, Saint Augustine's importance became less as Jacksonville increased in size. K.T.A.

See also FLORIDA (illustrations); FOUNTAIN OF YOUTH.

**SAINT AUGUSTINE'S COLLEGE** is a coeducational liberal arts school for Negroes at Raleigh, N.C. It is under the auspices of the Protestant Episcopal Church. Specialization courses include high-school teacher training, music, premedical, commerce, and physical

education. St. Augustine's was founded in 1867, and has an average enrollment of about 250.

**SAINT BARTHOLOMEW'S DAY, MASSACRE OF**, took place in Paris in 1572 on the feast day of Saint Bartholomew, August 24. On that day more than ten thousand French Protestants, or Huguenots, are said to have lost their lives. The massacre was the result of years of trouble between the Huguenots and Roman Catholics. Only two years before, the two parties had made peace with each other. It was agreed that Prince Henry of Navarre, the Huguenot leader, would marry Margaret of Valois, the sister of King Charles IX. The wedding took place in Paris a few days before the massacre.

Among those who attended the wedding was the Huguenot leader, Admiral Gaspard de Coligny. Because of his influence with the king, the queen mother, Catherine de Médicis, tried to have him killed. When the attempt failed, she persuaded the king that Coligny and other Huguenots wished to seize his throne. Charles then signed the death warrant of the supposed traitors. He is reported to have said: "I consent, but with the Admiral every Huguenot in France must perish, that no one may remain to reproach me with his death." The massacre spread to many towns in France, and thousands more were murdered within the following six weeks.

J.S.S.

See also CATHERINE DE MÉDICIS; CHARLES (IX, France); COLIGNY, GASPARD DE; HENRY (IV, France); HUGUENOT.

**ST. BENEDICT, COLLEGE OF**, is a liberal arts school for women at St. Joseph, Minn. It is operated by the

Catholic Order of St. Benedict, but students of all faiths are accepted. Majors are available in ten different subjects, and the courses lead to the B.A. and B.S. degrees. The college was founded in 1913, and has an average enrollment of about 250.

SR.I.G.

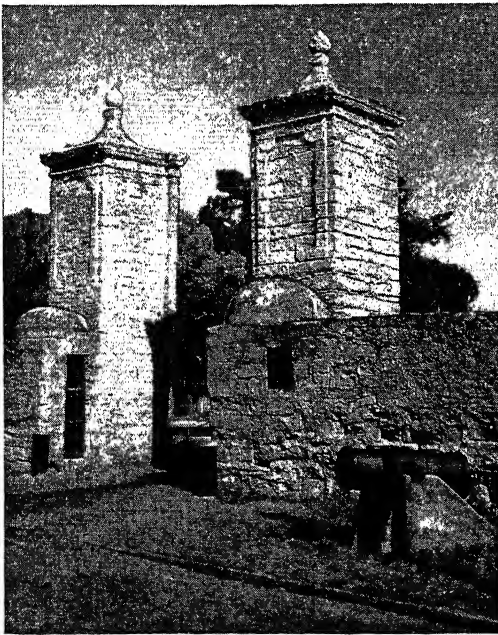
**ST. BENEDICT'S COLLEGE** is a liberal arts boarding school for men at Atchison, Kan. It is operated by the Catholic Benedictine Fathers, but students of all faiths are accepted. Courses lead to the bachelor's degree in arts, science, and music. Students live in modern rooming buildings on the campus. The college was founded in 1858, and has an average enrollment of about 350.

D.R.K.

**SAINT BERNARD.** The Saint Bernard is a large intelligent dog that has become famous for rescuing lost



The Sad-looking Saint Bernard is a large, burly dog, noted for its gentle disposition. It makes a wonderful pet and watchdog, but its appetite is a problem. A Saint Bernard's daily snack includes as much as six pounds of meat.



Louis C. Williams

**The Gates of Saint Augustine, Fla.,** were built as part of the city's defenses in 1804. They replaced the earlier wooden gates built by the Spaniards. These gates, like the wall and the fort, are built of coquina. Coquina is a soft limestone formed of broken shell and coral cemented together.

travelers. The dog gets its name from the fact that it was developed by a group of monks in the monastery of Saint Bernard, in the Alps of Switzerland. There were formerly foot travelers in the Alps. They often lost their way or became buried in sudden snowdrifts or snowstorms. The Saint Bernard was trained to rescue such persons. With its wonderful sense of smell, the Saint Bernard could find persons who were buried several feet under the snow. After it had found the lost traveler, it called out for help by barking loudly. After the rescuers came, the Saint Bernard led them back to the monastery. There is practically no foot travel today.

The Saint Bernard is valued throughout the world as a watchdog. It is also an excellent guide dog and pet. It is strong and very tall, measuring about 2½ feet from the shoulder to the ground. It weighs from 140 to 220 pounds, and is one of the heaviest of all dogs. The dog has a red and white body with some black at the head. Its fur may be either long or short, although in America the most common type has long hair. The Saint Bernard has a large, square head, a short muzzle, and a short strong neck. It has a loud, frightening bark. But the Saint Bernard is very loyal and very gentle, particularly to children and the helpless.

S.E.M., JR.

See also Dog (color plate, Working Dogs).

**SAINT BERNARD, GREAT**, and **SAINT BERNARD, LITTLE**. These high passes over the Alps are noted chiefly for the hospices, or refuges for travelers, which are at their tops.

**Great Saint Bernard** lies about 8,100 feet above sea level. Here the Augustine monks offer refuge for travelers at any time of the day or night. During the icy winter months the monks and their famous Saint Bernard dogs save the lives of many wayfarers. Great Saint Bernard hospice was founded by Saint Bernard of Nemthou in the 1000's. The life of the monks at the hospice is so severe in the winter that only young men are chosen for service here.

Many foreigners visit Great Saint Bernard hospice in the summer. It now has room for more than 300 persons. But nobody is ever allowed to stay longer than one day, except in case of illness, injury, or terrible winter storms.

Visitors announce their arrival by ringing a great bell which hangs in the entrance hall. Before its clanging echoes have died away in the distant halls, a monk appears to ask the visitors' wishes. No payment is permitted for food and lodging, but every visitor is expected to place some money—the amount varying according to his means—in a little box in the chapel.

An excellent motor road runs over Great Saint Bernard Pass from Martigny, Switzerland, to Aosta, Italy.

**Little Saint Bernard** is about fifteen miles southwest of Great Saint Bernard. The hospice at its top was founded and is maintained in the same way as Great Saint Bernard hospice. Little Saint Bernard lies 7,170 feet above sea level, and is ten miles south of Mont Blanc, the highest peak in Europe. This is the easiest route across the Alps, with a good auto road. W.R.McG.

See also ALPS; DOG (Usefulness of the Dog); SAINT BERNARD.

**ST. BERNARDINE OF SIENA COLLEGE** is a liberal arts school for men at Loudonville, N.Y. The evening division is coeducational. The college is operated by the Catholic Franciscan Fathers, but students of all faiths are accepted. Courses lead to the bachelor's degree in arts, science, business administration, and economics. The college was founded in 1937, and has an average enrollment of about 550. M.K.E.

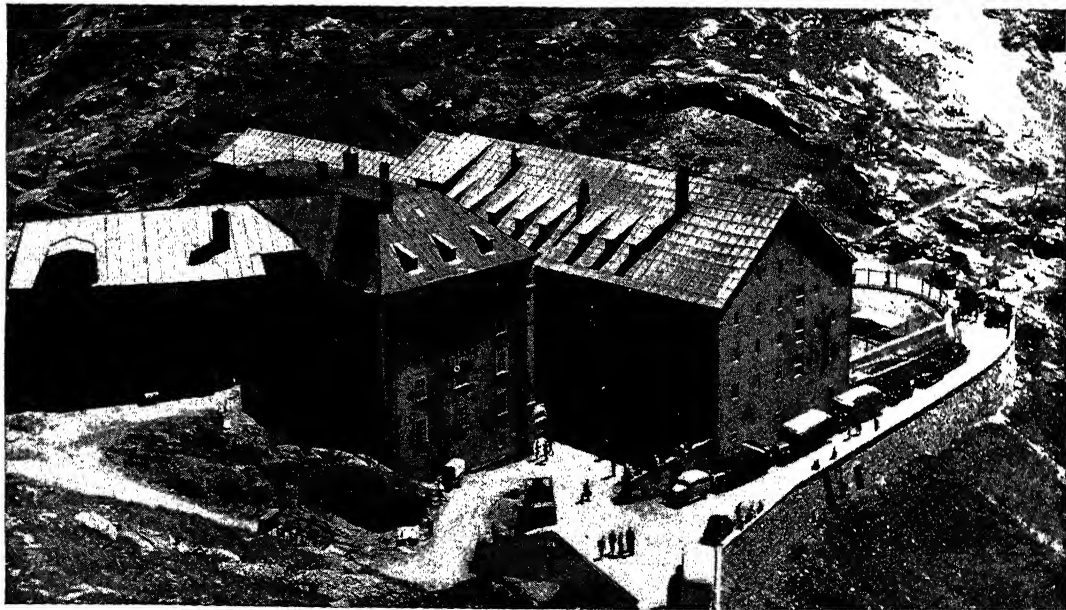
**ST. BONAVENTURE COLLEGE** is a coeducational liberal arts and sciences school at St. Bonaventure, N.Y. It is operated by the Franciscan Order of the Catholic Church. Courses lead to the bachelor's, master's, and doctor's degrees. Out-of-town students live in the college dormitory. The college library has a several-thousand volume microfilm collection of books printed in England during the 1600's and 1700's. St. Bonaventure was founded in 1859, and has an average enrollment of about 500. I.H.

**SAINT BONIFACE**, Manitoba (population 18,157), lies on the east bank of the Red River directly across from the city of Winnipeg. Saint Boniface is part of the Greater Winnipeg area. One of the largest stockyards in western Canada is at Saint Boniface. The city is also noted for its flour mills, meat-packing plants, steel mills, and paint factories.

Saint Boniface is the French center of Manitoba. The older part of the city has preserved the language and many of the customs of the early French Canadians who settled here during the fur-trading days of the 1700's.

In 1819 Saint Boniface College was founded, and in 1820 the town became the site of a Roman Catholic bishopric. Saint Boniface Cathedral was completed in 1918. Louis Riel, leader of the *métis* (half-breeds) in the Red River disturbances of 1869 and 1870, is buried in the Cathedral yard. A.R.M.L.

**ST. CATHERINE, COLLEGE OF**, is a liberal arts school



**Hospice of Saint Bernard**, on Great Saint Bernard Pass in the Alps, has been a refuge for travelers for nearly 1,000 years.

In winter the snow in the Alpine Valley is sometimes so deep that monks leave the hospice through the second-floor windows.

Bosshard, Black Star

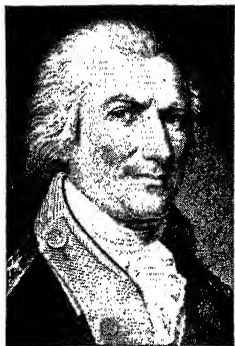


for women at St. Paul, Minn. It is operated by the Catholic Sisters of St. Joseph of Carondelet. Specialized subjects offered include library, nursing, and kindergarten education. Courses lead to the bachelor's degree. All out-of-town students live in the college dormitories or with relatives in the Twin Cities. The college was founded in 1911, and has an average enrollment of about 700.

SR.A.

**SAINT CHRISTOPHER, or SAINT KITTS.** See LEEWARD ISLANDS.

**ST. CLAIR, ARTHUR** (1736?-1818), was a Scottish-American soldier and statesman. He was born in Thurso, Scotland, of wealthy parents. He studied medicine for a time at the University of Edinburgh, but left school after he inherited a large fortune. In 1757 he became an officer in the British army and served in America during the French and Indian War. St. Clair took part in the expeditions against Louisburg and Quebec. He resigned from the army in 1762 and settled on an estate in western Pennsylvania.



Brown Bros.

**Arthur St. Clair**, an outstanding soldier in the American Revolution

When the Revolutionary War broke out, he joined the colonial army and organized the New Jersey troops. St. Clair fought at Trenton and Princeton and was made a major general. He was placed in command of Fort Ticonderoga, but was later relieved of his duties because he surrendered the fort to General John Burgoyne.

After the war St. Clair became interested in politics and was elected to the Continental Congress. In 1787 he became president of Congress, and in 1789 he was made governor of the Northwest Territory. Two years later he was given command of the United States army and fought against the Miami Indians. His forces were defeated and he resigned his command.

In 1802 St. Clair objected to the law which made Ohio a state, and he was forced to give up the position as governor of the Northwest Territory.

N.G.G.

#### SAINT CLAIR, LAKE.

This lake and the Saint Clair River form links in the system of connecting waterways between Lakes Huron and Erie. The lake and river also form much of the boundary between the state of Michigan and the province of Ontario.

Lake Saint Clair is shaped like a rough circle. It is about twenty-five miles across the center, and covers a total area of about 460 square miles. Over half of the lake is in Ontario. The lake's surface is about six feet lower than that of Lake Huron and two feet higher than that of Lake Erie. The average depth of Lake Saint Clair is only nineteen feet. But it has been dredged throughout, so that large ships can travel across it on their way to Lakes Huron or Erie. Lake Saint Clair is drained by the Detroit River, which connects it with Lake Erie. Lake Saint Clair is connected with Lake Huron by the Saint Clair River.

The Saint Clair River separates into seven channels and flows through a fan-shaped delta as it enters Lake Saint Clair. One of the channels in the delta has been dredged and made into a canal, and the river itself has also been dredged. Large lake steamers travel up the Saint Clair Canal and the Saint Clair River on their way to and from Lake Huron.

L.D.,JR.

**SAINT-CLAIRE DEVILLE, HENRI ÉTIENNE** (1818-1881). See ALUMINUM.

**SAINT CLOUD, Minn.** (population 24,173), is the seat of government of Stearns County, which produces more butter than any other county in Minnesota. There are large dairies and creameries in Saint Cloud. Large granite quarries in the region provide the basis of many of the city's industries. Saint Cloud lies on the Mississippi River, about forty miles northwest of Minneapolis. Among the important industrial plants in Saint Cloud are railway repair shops, two foundries, and paper-manufacturing establishments. Two railroads pass through the city. Saint Cloud has an airport.

In the early days, Saint Cloud was a terminal of the famous Red River cart trails from the Earl of Selkirk's Red River Colony (now Winnipeg) to the Mississippi River. Before railroads spread into the region beyond the Mississippi in the 1870's, Saint Cloud was the outfitting point for stagecoaches on their way west, for military supplies needed at various western army posts, and for prospectors seeking to locate gold mines in Montana and Idaho.

Two universities near Saint Cloud make it easy for residents of the city to get a higher education. They are Saint John's University, at Collegeville, and the College of Saint Benedict, at Saint Joseph.

G.L.N.

**SAINT CROIX, kroi.** See VIRGIN ISLANDS.

**SAINT CROIX RIVER.** See MAINE (Rivers and Lakes).

**ST. DENIS, RUTH** (1880- ), is an American dancer and teacher. She helped to make professional dancing a recognized art in America. Oriental and American Indian dances that she created interpret the poetry and traditions of these peoples. She also brought dramatic unity to the dance stage by providing special music, scenery, costumes, and lighting effects to harmonize with the dances.

Ruth St. Denis was born in Newark, N.J., and gave her first dance program in New York City in 1906. In 1915 she and her husband, Ted Shawn, founded the Denishawn School of Dancing in Los Angeles, Calif. The two headed the Denishawn Dancers, who toured the United States and England from 1922 to 1925, and then toured the Orient. In later years Ruth St. Denis presented religious pageants, such as the *Masque of*



Location Map of Lake St. Clair



Knopf, Pix

Ruth St. Denis Twirling Gracefully as she performs a Spanish gypsy dance. She is shown here at the age of 62, when she was on tour giving recitals. Her skillful performances helped make the dance popular in the United States.

Mary at the New York World's Fair in 1941. M.C.C.  
See also SHAWN, "TED."

**SAINT DUNSTAN'S COLLEGE** is a men's school at Charlottetown, Prince Edward Island, Canada. It is controlled by the Catholic Church. Courses are offered in the liberal arts. The extension department of the college works among farmers and fishermen. The college was founded in 1855 and has an average enrollment of about 100.

R.V. MacK.

**SAINTE ANNE DE BEAUPRÉ**, *bo PRA*, is a Roman Catholic shrine in Montmorency County, Quebec. It is a place where many miracles are said to have been performed. Hundreds of thousands of ill and crippled men and women have made pilgrimages to the shrine. Hundreds have left their crutches in the church as tokens of their healing. Sainte Anne de Beaupré has come to be known as "the American Lourdes." Lourdes is a French shrine where many are said to have been healed.

An old legend tells how the first chapel was built there, during the early days of French settlement in Canada. A boatload of Breton sailors was being tossed about wildly by the waves on the Saint Lawrence River. The frightened sailors prayed to Sainte Anne, the patron saint of sailors. They promised to build a chapel in her honor if they were saved. When the storm passed, the grateful men landed where the Saint Lawrence joins the Sainte Anne River near Quebec. Here they built a rude church in 1658. It was rebuilt in 1878.

In 1876 a new church was built near by. Eleven years later it was created a basilica by Papal decree. The splendid church was destroyed in 1922 by a fire which began in the pile of crutches. But a monk saved the relic

of Sainte Anne which had been brought from France in 1670, and a statue of the saint. The church has since been rebuilt.

F.J.S.

**SAINTE-BEUVE**, *sant BUV*, **CHARLES AUGUSTIN** (1804-1869), was an essayist, poet, and the greatest literary critic of France of the 1800's. He wrote more than fifty volumes, in addition to the critical and biographical articles which were his most important work. Sainte-Beuve had a delicate, exact style and an appreciation of permanent values. He developed an original form of essay which combined biographical knowledge with critical interpretation.

Sainte-Beuve was born in Boulogne. He was educated in Paris and practiced medicine for a short time. In 1827 his newspaper articles attracted the attention of Victor Hugo. Hugo introduced him to other writers and he devoted all his time to writing.

His three volumes of poetry are highly finished but rather pessimistic. His novel, *Volupté*, shows his religious unrest.

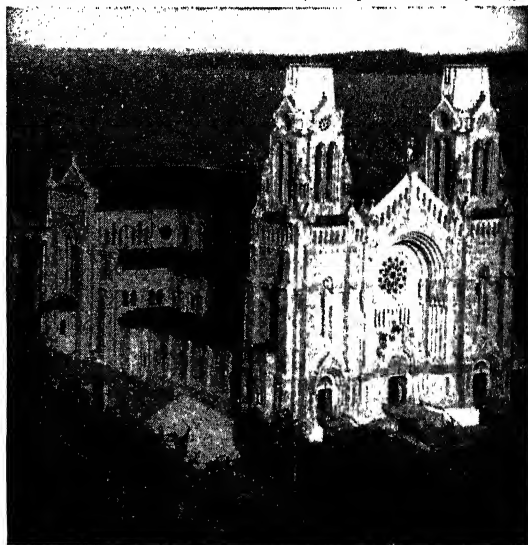
L.J.

**ST. EDWARD'S SEMINARY**, near Kenmore, Wash., trains young men for the Catholic priesthood. The school is operated by the Sulpician priests and has a twelve-year course. It was founded in 1931 and has an average enrollment of about 150.

J.P. MacC.

**SAINT ELIAS RANGE.** These ice-covered mountains extend in a broad chain of peaks and ridges along the southeastern boundary of Alaska and Canada. They give off many huge glaciers, the largest of which is the Malaspina (see *GLACIER*). Rain falls almost every day on the lower slopes, and snow falls daily above 4,500 feet above sea level. Mount Logan, the high peak, rises to 19,850, according to the measurement of Professor Israel C. Russell. He named the peak in honor of the Canadian geologist, Sir William E. Logan.

Mount Saint Elias is next in height. It towers 18,008 feet above the sea. The majestic beauty of Mount Saint Elias is breath-taking when seen from the Pacific Ocean. The seaward slope, which is very steep, has many large



Sawder#

The Basilica of Sainte Anne de Beaupré is one of the most frequently visited religious shrines in North America.

glaciers, and covered with snow from base to summit. The mountain was discovered and named in 1741 by Bering, a navigator in the Russian service. But it was not explored until 1874. In that year, the United States, which had purchased Alaska from Russia in 1867, sent an expedition to examine the glaciers around the mountain. The Duke of the Abruzzi made the first climb to the top of Mount Elias in 1897. Other peaks of the chain are Mount Fairweather, Mount Cook, and Mount Vancouver.

L.D., Jr.

See also **BERING, VITUS; MOUNTAIN** (illustration, Highest Mountains of the World).

**SAINT ELIZABETH, COLLEGE OF**, is a Catholic women's school at Convent Station, N.J. Courses are offered in the liberal arts, business administration, home economics, and premedical and teacher training. About two thirds of the students live in residence halls. The college was founded in 1899 and has an average enrollment of about 500.

Sr. M.J.B.

**SAINT ELMO'S FIRE** is the name given to a round flash of light that is seen in a thunderstorm around ships. This flash of light gets its name from the fact that it looks like fire. It is actually a charge of electricity caused by the storm. In stormy weather this flash can sometimes be seen around the masts of ships, at the top of steeples, and at the top of trees. It may also be seen during a storm around the manes of horses and even around the heads of people.

The name Saint Elmo's Fire is a corrupted form of the name of Saint Erasmus, who was considered the patron saint of Mediterranean sailors.

**SAINT ÉTIENNE.** See **FRANCE** (Cities).

**ST. FRANCIS, COLLEGE OF**, is a liberal arts school for women at Joliet, Ill. It is controlled by the Roman Catholic Church. The college has studies in art, biology, chemistry, economics, English, French, German, history, Latin, mathematics, applied and theoretical music, philosophy, sociology, and Spanish. St. Francis College was founded in 1925 and has an average enrollment of about 350.

Sr. M. Sr.

**SAINT FRANCIS COLLEGE** is a liberal arts school for men at Loretto, Pa. It is controlled by the Catholic Church, but students of all faiths are admitted. Students live in cottages on the campus. The college was founded in 1847 and has an average annual enrollment of about 200 students.

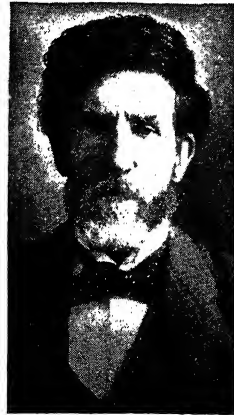
F.P. KIN.

**SAINT FRANCIS RIVER.** See **QUEBEC** (Rivers, Waterfalls, and Lakes).

**ST. FRANCIS XAVIER, UNIVERSITY OF**, is a coeducational school of arts and sciences at Antigonish, Nova Scotia. It is controlled by the Roman Catholic Church. Two other schools are connected with the university. One is the Preparatory School which prepares the students for university training. The other is Mt. St. Bernard College for women. St. Francis Xavier University was founded in 1855 and has an average enrollment of about 400.

**SAINT-GAUDENS, GAW denz, AUGUSTUS** (1848-1907), is considered one of the greatest American sculptors of all time. His work is noted for its lifelike qualities. Saint-Gaudens is also famous for his delicate low reliefs. He learned to cut fine designs during his early training as a cameo cutter, or engraver of fine jewelry.

Saint-Gaudens was born in Dublin, Ireland, but was brought to the United States when he was six months



Brown Bros.

**Augustus Saint-Gaudens** carved many of America's public monuments.

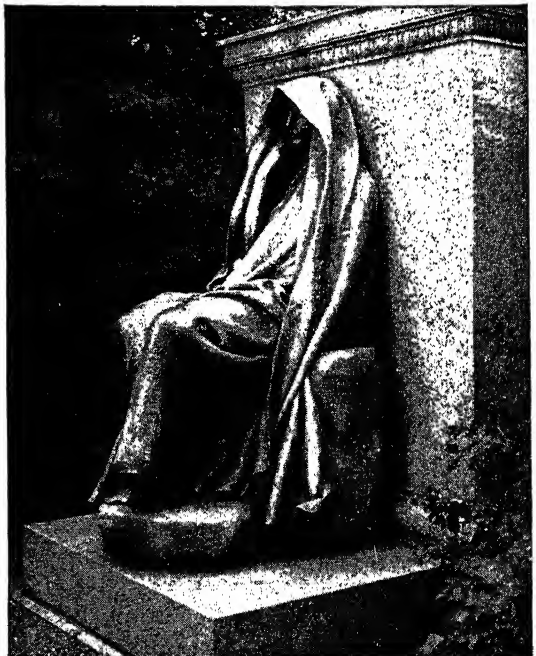
old. He attended school in New York City but left at the age of thirteen to work for a cameo cutter. Saint-Gaudens studied drawing at the Cooper Institute, and later at the National Academy of Design. When he was twenty he went to Paris, where he studied for three years at the École des Beaux Arts. Saint-Gaudens spent the next three years studying in Rome. His earliest work was a bronze bust of his father.

In 1880 he exhibited his statue of Admiral David Farragut at the Paris Salon. This work made him famous overnight. It now stands in Madison Square in New York City. It was the first of the many public monuments Saint-Gaudens made.

He returned to the United States shortly after his success in Paris and opened a studio in New York City. He spent his summers in Cornish, where he died.

F.Ho.

His Works include "The Puritan" or "Deacon Chapin," in Springfield, Mass.; "The Shaw Memorial," in Boston; "The Seated Lincoln," in Chicago; and "Governor Randall" on Staten Island, in the harbor of New York City.



Louis C. Williams

The Statue, "Grief," by Augustus Saint-Gaudens was named "The Mystery of the Hereafter" by the sculptor. Its present name is credited to Mark Twain, who remarked that all human grief is shown in this sad figure. The statue marks the grave of Henry Adams' wife in Rock Creek Cemetery, Washington, D.C.

**SAINT GEORGE**, Utah (population 3,591), is the site of a \$500,000 Mormon Temple, the first to be built in Utah. The city has the warmest and one of the most healthful climates in the state. Saint George lies in the southwestern corner of Utah, about five miles north of the Arizona border. It is located in a valley called "Utah's Dixie," because the climate is as good for raising grapes, figs, cherries, peaches, and apricots, as that of some sections in the southern states. Saint George was founded in 1861. Cotton growing and cotton milling were important industries here for many years. J.C.AZ.

**SAINT GEORGE BAY.** See CAPE BRETON ISLAND.

**SAINT GEORGE ISLAND.** See PRIBILOF ISLANDS.

**SAINT GEORGE'S CHANNEL** is an arm of the Atlantic Ocean which separates Wales from the south of Ireland. It is about 100 miles long, and from 60 to 100 miles wide. The channel runs from Holyhead and Dublin to Saint David's Head, joining the Irish Sea with the Atlantic Ocean. H.U.S.

**SAINT GEORGE'S CROSS**, or **GREEK CROSS**. See CROSS (illustration).

**SAINT GEORGE'S FLAG.** See FLAG (color plate, Flags of British Commonwealth of Nations).

**SAINT GERMAIN**, *sahn jer MAN*, **TREATY OF**. The Allied powers and the republic of Austria signed the treaty of Saint Germain on September 10, 1919. Twenty-five allied countries signed the agreement which completely broke Austria's power. Rumania and Yugoslavia were the only two Allied countries which delayed in signing. These countries objected to treaty guarantees given to national minorities. Several months passed before the Rumanian and Yugoslavian governments were persuaded to sign the document. The Austrian National Assembly ratified the Treaty of Saint Germain on October 17, 1919, and the agreement went into force on July 16, 1920.

The Treaty of Saint Germain was very much like the Treaty of Versailles. Part I of the treaty provided that Austria could be admitted to the League of Nations after a period of good behavior. Part II reduced Austria's territory from about 115,000 square miles to a little more than 6,000 square miles. The population of Austria was thereby reduced from 30,000,000 to about 6,000,000. Eight clauses of the treaty guaranteed the independence and safety of minority groups within the country.

The Treaty of Saint Germain gave complete independence to Poland, Yugoslavia, Czechoslovakia, and Hungary. These nations, together with Italy, also gained much territory that Austria had controlled before the war. Military clauses in the treaty reduced the Austrian army to 30,000 soldiers. Only one factory could manufacture military armaments. Much of the Austro-Hungarian navy passed into the hands of the Allies, and Austria was left with only four patrol boats. Even these were only for inland water protection, for Austria had lost all its seaports.

One of the important clauses of the Treaty of Saint Germain forbade union between Austria and Germany. But in 1938 Hitler forced a union with Austria. World War II set aside the Treaty of Saint Germain. D.E.L.

**SAINT GOTTHARD**, *saynt GOT erd*, or **SAINT GOTTHARD, MOUNTAINS**. This high plateau or mountain group in the Lepontine Alps of Switzerland occu-

pies an area of 644 square miles in the Swiss cantons of Uri, Valais, and Ticino. Pizzo Rotondo (10,490 feet) is the highest of several lofty peaks. The famous Saint Gotthard Pass has been used since the 1200's. A fine winding road crosses over the mountains at a height of 6,935 feet. The Hospice of Saint Gotthard once gave assistance to travelers through the pass. The Saint Gotthard Tunnel, nine miles long under the pass, was completed in 1880, and the first railroad trains started through it the following year. The mountains are famous for their Alpine flowers and plants. The Rhine and Rhone rivers rise in these mountains. W.R.McC.

**SAINT HELENA**, *heh LE nah*, is a British island in the Atlantic Ocean. It lies about 1,200 miles off the southwestern coast of Africa, and about 700 miles southeast of Ascension Island, which is the nearest land. Saint Helena is famous in history because Napoleon Bonaparte was forced to live on the island from 1815 until his death on May 5, 1821. (See NAPOLEON I.) The Portuguese discovered Saint Helena in 1502, but the island has belonged to Britain since 1651. It serves as the administrative center for certain other British islands in the southern part of the Atlantic Ocean, namely Ascension, Tristan da Cunha, Gough, Nightingale, and Inaccessible.

Saint Helena is rough and mountainous. It covers an area of forty-seven square miles of lonely, volcanic wasteland. Barren cliffs rise 1,000 feet above sea level at some points. The only village and port on the island is Jamestown, the capital, which stands at the mouth of a small mountain stream near Saint James' Bay. Saint Helena has an estimated population of 4,710. The people are Europeans, East Indians, and Africans.

Less than a third of Saint Helena can be used for raising crops. The chief crop is potatoes. Part of the island is covered with grasslands where cattle and sheep graze. The government has helped to set up factories for making fiber mats. Other industries are fish curing and lacemaking. See also JAMESTOWN. H.V.B.K., JR.

**ST. HELENS, MOUNT.** See MOUNTAIN (illustration, Highest Mountains of the World); WASHINGTON (Location, Size, and Surface Features [Cascade Mountain Region]).

**SAINT JOHN.** See VIRGIN ISLANDS.

**SAINT JOHN**, New Brunswick (population 51,741). In 1785 Saint John became the first incorporated city in Canada. Today it is the largest city in its province. It lies on the north shore of the Bay of Fundy, at the mouth of the Saint John River. Saint John is one of the two winter ports on Canada's east coast. The waters in its harbors are never frozen. One of the largest dry docks in the world is in Saint John. Steamers from all parts of the world dock at this port, especially ships carrying cargoes from the West Indies. The famous Reversing Falls are on the Saint John River near the city.

Saint John has many industries including lumber mills, pottery-making plants, and a brush factory. The Canadian National Railway and the Canadian Pacific Railway cross the city. There is an airport at the edge of the city.

The river was discovered by Samuel de Champlain on the feast day of Saint John the Baptist in 1604. The first settlement in this region was a fur-trading post. Later

a small fort was built here. Rival French traders, and the English fought over the settlement. Settlers from the American colonies, known as the United Empire Loyalists, founded the city in 1783. M.J.T.

**SAINT JOHN, KNIGHTS HOSPITALERS OF.** See **KNIGHTS OF SAINT JOHN.**

**SAINT JOHN, LAKE.** See **QUEBEC** (Rivers, Waterfalls, and Lakes).

**SAINT JOHN LATERAN.** See **LATERAN.**

**SAINT JOHN RIVER.** The picturesque Saint John is the main waterway of New Brunswick, Canada. It is over 400 miles long, and drains an area of more than 21,500 square miles. The Saint John is formed by the joining of several small streams, which rise on or near the boundary between Quebec and northwestern Maine. The river flows northeast to cross the northwest corner of Maine, then forms the boundary between Maine and New Brunswick. After the river enters New Brunswick, it continues south for about seventy-five miles, and finally empties into the Bay of Fundy.

The Saint John is one of the most beautiful rivers in the Maritime Provinces. It is often called the "Rhine of America." Three miles after the stream leaves Maine and enters New Brunswick, it plunges over the Grand Falls, a drop of seventy-five feet. The rapids continue for nearly a mile below the falls, and the river drops another seventy-five feet as it surges through this section. Ships can travel up the Saint John from its mouth to Woodstock, a distance of about 145 miles. At high water they sometimes go as far as Grand Falls, 225 miles from the

river's mouth. Above Grand Falls, boats can travel for forty miles more. Near the mouth of the St. John are the famous reversing falls of Saint John. L.D., Jr.

See also **REVERSING FALLS OF SAINT JOHN.**

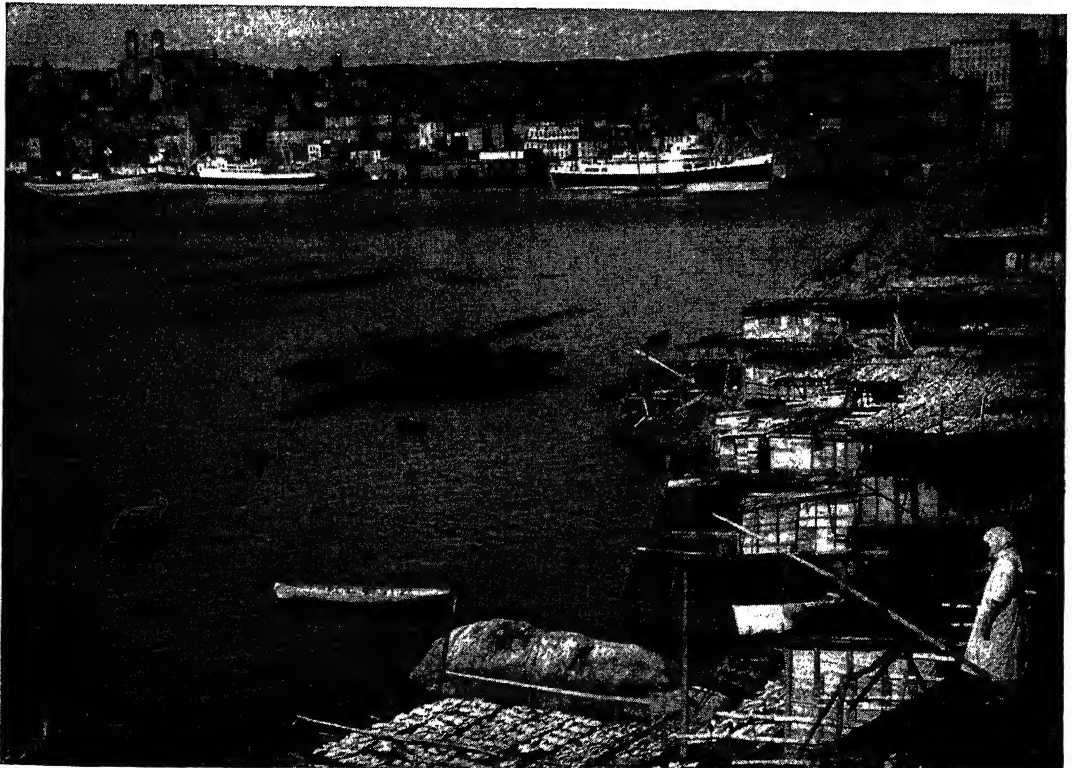
**SAINT JOHN'S,** Newfoundland (population 43,000), is the capital and center of industry of Newfoundland. Saint John's was founded in 1497, five years after Columbus discovered America. The city is one of the oldest cities in North America to be continuously occupied by white settlers. Saint John's was named for Saint John the Baptist because English fishermen discovered it on his feast day on June 24, 1497.

Marconi sent his first wireless message across the Atlantic to Ireland from Cabot Signal Hill Tower, in Saint John's. The first nonstop transatlantic flight in 1919 took off from Saint John's.

**Location, Size, and Description.** Saint John's lies on the eastern shore of Newfoundland, about five miles from Cape Spear, the easternmost point in North America. It is about 1,640 miles from Saint John's to Ireland. Saint John's is about 1,000 miles nearer to England than New York City.

Two hills, Signal Hill and Southside Hill, guard the entrance to the harbor, which is 1,400 feet wide at this point. On the peak of a slope on the northern side of the harbor is the Roman Catholic Cathedral, one of the largest in North America. The Colonial Building, the seat of British government in Newfoundland, is in the city proper.

**Cultural Life.** Saint John's is the home of the New.



Gustav Anderson

**Saint John's Excellent Harbor** accounts for the city's importance as Newfoundland's industrial and commercial center.

Cod are drying on the wharves in the foreground. At the upper left is the great Roman Catholic Cathedral.



foundland Memorial University College. Education in most of the schools in the city is carried on jointly by the Newfoundland government and the churches. The Saint John's Public Library is the center of Newfoundland's library system.

The Anglican Cathedral, one of the finest examples of Gothic architecture in North America, is one of many old churches in Saint John's.

**The People.** Fishermen from Devonshire settled in this region as early as 1500. Today, most of the inhabitants of Saint John's are descendants of early Irish and English settlers.

**Industry and Trade.** Manufacturing plants in Saint John's make such things as fishing equipment, rope, paints, varnishes, oilcloth, soaps, butterine, biscuits, and jams. Materials shipped to Saint John's from Great Britain, the United States, and all parts of Canada, are made into tobacco products, furniture, clothing, tinware, ironware, and shoes in the city.

Steamships from England and other Atlantic ports dock regularly in Saint John's harbor. The city has excellent railway and air-line service.

**History.** The village was valued as a cod-fishing port by the French and English in the 1600's and 1700's. It was twice destroyed in struggles for its control. Saint John's was also twice destroyed by fire. Today, a fair number of the buildings in the city are fireproof.

Saint John's remained the capital when Newfoundland was given to England by the Treaty of Utrecht in 1713. The city was an important base for the British fleet during the Revolutionary War and the War of 1812. It was also a very important base during World War II. The United States has a military base at Fort Pepperrell, near the east end of the city. This base was established in 1940 by an agreement with Great Britain.

G.A.F.

**SAINT JOHN'S-BREAD.** See CAROB.

**SAINT JOHNSBURY,** Vt. (population 7,437), is the largest community in northeastern Vermont. It is the home of a million-dollar maple-sugar processing industry. Saint Johnsbury lies on the main route from Vermont to the White Mountain region of New Hampshire. The town is about thirty miles northeast of Montpelier. The manufacture of weighing scales was started in Saint Johnsbury in 1830, when the first platform scale was invented here by Thaddeus Fairbanks.

A.W.F.

**ST. JOHN'S COLLEGE** is a men's school in Annapolis, Md. It is the third oldest college in the United States. St. John's is a private school and offers courses in the humanities and natural science. Francis Scott Key, author of "The Star-Spangled Banner," was one of its graduates. St. John's College was founded as King William's School in 1696. The average enrollment is about 180.

S.B.A.

**SAINT JOHNS RIVER.** See FLORIDA (Rivers and Lakes).

**ST. JOHN'S UNIVERSITY** is a coeducational school in Brooklyn, New York City. It is controlled by the Catholic Church. Courses are offered in the liberal arts, education, law, commerce, pharmacy, and nursing. The university was founded in 1870 and has an average enrollment of about 6,500.

W.J.M.A.

**SAINT-JOHN'S-WORT, or HYPERICUM,** is a handsome shrub with large yellow flowers. It is often used for the borders of gardens. Most Saint-John's-worts grow in the temperate and warmer regions of the Northern Hemisphere. They are usually rather low shrubs. Some are evergreen. The flowers bloom in clusters during the summer. Pink and purplish flowers are rare. These bushes grow well in loam or moist sandy soil. Most of them should have some shade. The larger Saint-John's-worts form rounded bushes when grown alone. The smaller ones are good for low borders or for ground cover. They grow well in rock gardens where they can be protected.

A.C.Ho.

**Classification.** Saint-John's-worts make up the genus *Hypericum*. *H. aureum* is wild in the South, and has showy flowers nearly two inches across. *H. calycinum* is called *rose-of-Sharon* and *Aaron's beard*. *H. moserianum*, called *goldflower*, is a hybrid.

**SAINT JOHN THE DIVINE, CATHEDRAL OF.** See CATHEDRAL (illustration); NEW YORK CITY (Churches).

**SAINT JOSEPH,** Mo. (population 75,711), is the trading center of a large fruit, livestock, and grain producing region. The largest plant in the United States for producing cholera serum for hogs is in Saint Joseph. The city also is the home of the largest paper-tablet and stationery factory in the nation. It is the third largest city of Missouri.

Saint Joseph lies in northwestern Missouri, on the Missouri River. It is about sixty miles north of Kansas City.

Saint Joseph has one of the largest livestock and meat-packing industries in the state. It is an important milling center for flour and cereals. There are many dry-goods concerns in the city. Manufacturing plants in Saint Joseph make textiles, clothing, candy, beverages, dairy goods, harnesses and saddles, chemicals, paper boxes, and iron goods.

The city was founded in 1826 by Joseph Robidoux, a French fur trader. It received a city charter in 1851. Saint Joseph was the starting point of the Pony Express route to the West Coast. See also PONY EXPRESS. R.S.C.

**SAINT JOSEPH COLLEGE** is a liberal arts school for women in West Hartford, Conn. It is controlled by the Catholic Church. The college was founded in 1925 and has an average enrollment of about 400.

**SAINT JOSEPH RIVER.** See MICHIGAN (Physical Features).

**SAINT JOSEPH'S COLLEGE** is a men's school in Philadelphia, Pa. It is conducted by the Jesuits. Courses are offered in the liberal arts and sciences. The college was founded in 1851 and has an average enrollment of about 450.

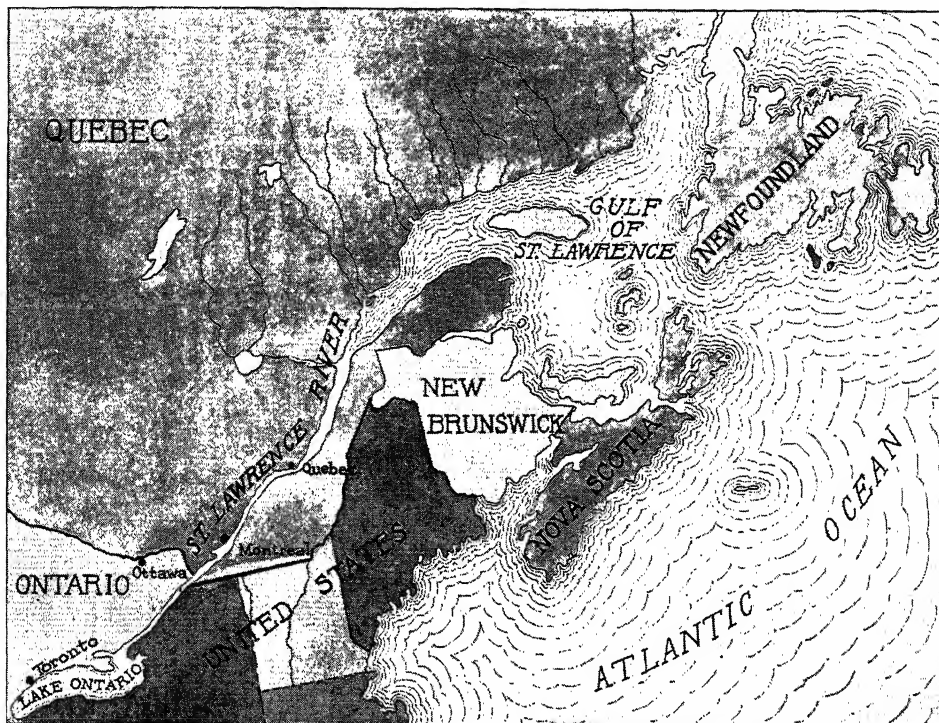
**SAINT JOSEPH'S COLLEGE** is a women's school at Emmitsburg, Md. It is controlled by the Catholic Church. Courses are offered in the liberal arts, technology, prenursing and premedicine, dietetics, home economics, secretarial science, and journalism. The college was founded in 1809 and has an average enrollment of about 180.

F.J.D.

**ST. JOSEPH'S COLLEGE FOR WOMEN** is a liberal arts school in Brooklyn, New York City. It is controlled by the Catholic Church. The college was founded in 1916 and has an average enrollment of about 350.

K.M.L.





Location Map of the Saint Lawrence River and the Gulf of Saint Lawrence

**ST. JOSEPH'S UNIVERSITY** is a school of arts and theology at St. Joseph, New Brunswick. It is controlled by the Roman Catholic Church. The school has three separate divisions, the preparatory school, the academic course, and the university course. The university division offers courses leading to degrees of B.S. and B.A. St. Joseph's University was founded in 1864 and has an average enrollment of about 250.

**SAINT KITTS.** See **LEEWARD ISLANDS**.

**SAINT LAWRENCE, GULF OF.** This deep arm of the Atlantic Ocean is the largest gulf on the North American coast, except for the Gulf of Mexico. The Gulf of Saint Lawrence is partly bordered by Newfoundland on the east, and by Nova Scotia and New Brunswick on the south. It washes the eastern shores of Quebec. The gulf is the outlet of the Saint Lawrence River and the Great Lakes, which are the chief highways of trade for Eastern Canada and the northern United States. This makes the gulf the gateway to the great transatlantic trade of Canada. It is the shortest northern route to Liverpool. It is 293 nautical miles shorter from Belle Isle Strait in the Gulf of Saint Lawrence to Liverpool, England, than from New York to Liverpool. The gulf enters the sea by two deep channels, the Cabot Strait and the Canso Strait. The Cabot Strait is over sixty miles wide and is the largest outlet. It lies between Cape Breton and Newfoundland. Canso Strait separates Cape Breton and Nova Scotia.

Telegraph cables cross the Gulf of Saint Lawrence, and many steamers sail between Quebec and the Maritime Provinces. The tides are low, but the changing currents, dense fogs, and floating ice often make ship-

ping dangerous. Prince Edward Island is in the south of the gulf, and the northern inlet of this island is Richmond Bay. Anticosti Island is near the mouth of the Saint Lawrence River. There are several clusters of smaller islands, especially in the southern part of the gulf. Many tiny islands lie along the rocky northern shores. Large cod, herring, mackerel, and smelt fisheries have been the chief means of income to a large part of the people of the islands and on the gulf coasts.

Both the Gulf of Saint Lawrence and the Saint Lawrence River were discovered by Jacques Cartier. On his second trip, on August 10, 1535, Cartier entered a bay on the north coast of the gulf. It was the feast day of Saint Lawrence, and he called the gulf the *Baye Saint Laurens*. This name was gradually applied to the gulf and river.

H.U.S.

See also **SAINT LAWRENCE RIVER**; **SAINT LAWRENCE WATERWAY AND POWER PROJECT**.

**SAINT LAWRENCE ISLANDS NATIONAL PARK.** See **CANADA** (National Parks and Forests).

**SAINT LAWRENCE RIVER.** This majestic stream is the largest river of Canada and one of the largest rivers of the world. It is often called "The Mother of Canada." Its wide, deep waters were the first highways of the explorers, fur traders, and colonists who came to Canada in the early days of the settlement of North America.

Some authorities estimate that the Saint Lawrence is second only to the Amazon in the amount of water that it pours into the ocean every day. The river drains an area of more than 500,000 square miles, including the Great Lakes and the southeastern part of Canada.

## SAINT LAWRENCE RIVER

The Saint Lawrence begins at the outlet of Lake Ontario, and flows in a northeasterly direction for about 750 miles until it enters the Gulf of Saint Lawrence. But the source of this vast river system is the Saint Louis River, which rises in northeastern Minnesota and enters Lake Superior at Duluth. The Saint Mary's River joins Lake Superior to Lake Huron. The Saint Clair and Detroit rivers connect Lakes Huron and Erie. And the waters of the Niagara River "shake the earth" at the great falls and rapids between Lakes Erie and Ontario.

Many smaller streams empty tons of water each day into the broad Saint Lawrence. From the north the Ottawa River pours its dark flood of water into the clear waters of the main stream at the island of Montreal. Other branches that enter the Saint Lawrence from the north include the Saint Maurice River, which is noted for its high falls, the Montmorency River, famed for its cascade, and the Saguenay. From the south, the Saint Lawrence receives the waters of the Saint Regis, which rises in the foothills of the Adirondacks. The Richelieu, which is the outlet for Lake Champlain, the Chaudière, and a number of other less important streams also enter the Saint Lawrence from the south.

**General Description.** The Saint Lawrence has an average width of a mile and a quarter as it flows from Lake Ontario to Quebec. In some places, the great river narrows to less than a mile, but in others, it expands to form "lakes." The most famous of these lakes

## SAINT LAWRENCE RIVER

are Lake Saint Francis, a 31-mile long stretch of water above Montreal, and Lake Saint Peter, which is 28 miles long and located halfway between Montreal and Quebec. The channel of the Saint Lawrence slowly broadens below Quebec to form the great estuary, or sunken river mouth, that blends with the Gulf of Saint Lawrence at Anticosti Island. Below the Isle of Orleans, the channel of the river is never less than ten miles wide. The Saint Lawrence is twenty-five miles wide where the Saguenay empties into it, and opposite Gaspé, the distance from shore to shore is fifty miles.

The mud and silt of the streams that flow into the Great Lakes settles in them. As a result, the waters of the Saint Lawrence are unusually pure and clear. There is a great deal of rainfall over the whole area of the Great Lakes and the section of Canada that the river drains. But the lakes have such an equalizing effect on the water that the river does not rise and fall suddenly. Disastrous floods along the Saint Lawrence are unknown, except for a few overflows in the spring, when the channel is blocked by ice.

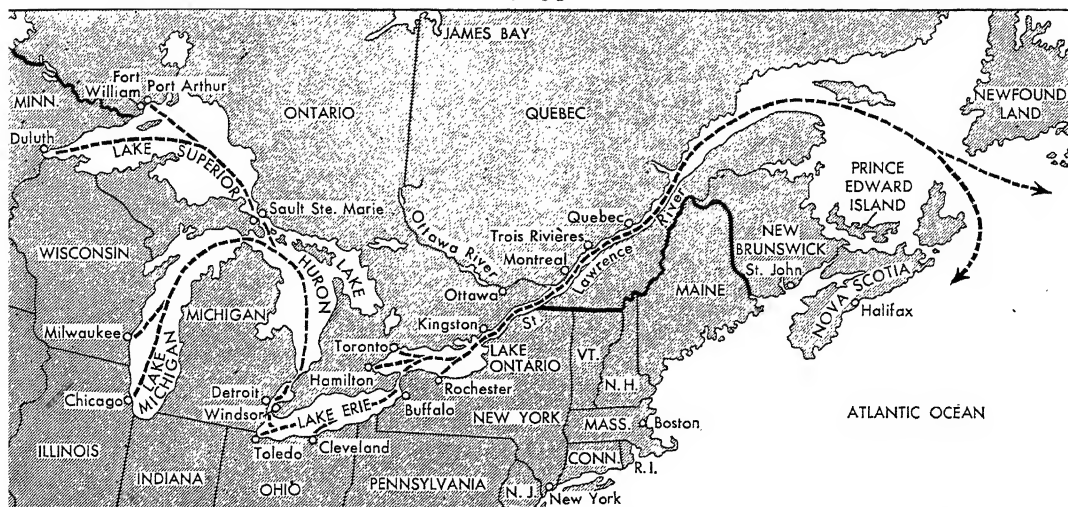
The river drops a total of 246 feet between Lake Ontario and the city of Quebec. Most of this fall is above Montreal. Between Lake Ontario and Montreal, there are about thirty miles of rapids. The tide goes up the river as far as the Saint Maurice River, at Three Rivers. Here, at spring tide the water may rise as high as nineteen feet. The rise at Quebec is nearly as great. L.D., JR.



**The Saint Lawrence River's International Bridge** links Canada and the United States. On the far side of the great waterway is the United States border. In the river are the heavily

wooded Thousand Islands which are used to reduce the span length of the structure. The bridge extends from Collins Landing, N.Y., to Ivy Lea, near Gananoque, Ontario.

Ewing Galloway



**The Saint Lawrence Waterway** is a plan for a deep channel from the Atlantic Ocean to the Great Lakes. The Saint Lawrence River would require dredging between Kingston and

See also RIVER (illustration, Longest Rivers of the World); SAINT LAWRENCE, GULF OF; SAINT LAWRENCE WATERWAY AND POWER PROJECT; THOUSAND ISLANDS.

**ST. LAWRENCE UNIVERSITY** is a coeducational arts and sciences school in Canton, N.Y. It is a private college, and students of all faiths are admitted. The university was founded in 1856 and has an average enrollment of about 750.

E.K.G.

**SAINT LAWRENCE WATERWAY AND POWER PROJECT** is a plan to build a deep channel from Lake Superior to the Atlantic Ocean by way of the Saint Lawrence River. The project would bring the central and western parts of the United States and Canada 1,000 miles nearer to Europe.

The International Joint Commission, which was created by the Treaty of 1909, has authority over the boundary waters of Canada and the United States. In 1920 the United States Government and the Canadian Government asked the International Joint Commission to find out whether further improvements were necessary in the upper Saint Lawrence region to get the highest efficiency in navigation. The two governments also wished to know if further water power could be developed in this region.

The commission, made up of three members from each country, studied the question for more than a year. It issued a report to the two governments in 1921. The commission suggested two combined plans, but the project was so tremendous that further investigation was begun. The United States and Canadian governments each named three engineers on a joint board of six members, and an advisory committee, to deal with the business side of the problem. Herbert Hoover was at the head of the United States committee.

The advisory board and the committees agreed with the commission's opinion that the project should be undertaken. Direct arrangements began on April 13, 1927, and continued for several years. On July 18, 1932, representatives of the United States and Canada signed a treaty authorizing the construction of the canal

Montreal. The project would make the lake cities ocean seaports, and greatly shorten the distance from the Middle West to Europe. It would also develop tremendous electric power.

and power dams. The treaty was signed at Washington. It now has to have the official approval of the United States Senate and the Canadian Parliament.

**Details of the Project.** There are 183 miles of the Saint Lawrence River which would have to be deepened to allow navigation of large ships. It is necessary to go around three sets of rapids in the river. One set of rapids extends over 110 miles of river along the International Boundary. The other two sets of rapids, which are shorter but steeper, are in Canada. There is a series of fourteen-foot canals now being used, which were built by Canada. These canals provide for navigation throughout the entire stretch of the Saint Lawrence River. The treaty provides that twenty-seven-foot canals should be built to replace the fourteen-foot canals.

The total cost of the project is figured at \$543,429,000. The United States will pay \$272,453,000 of the total. The Canadian share is smaller, since the Canadian Government has already built some of the works needed for the project, such as the Welland Canal, which was completed in 1932 at a cost of about \$128,000,000.

Navigation is the most important purpose of the project, but it also includes plans for producing 5,000,000 horsepower of electric energy. About 2,200,000 horsepower of energy would be located in the international section. The United States would control 1,100,000 horsepower, which would be furnished to New England, New York, and New York City. The cost of the electric development is to be paid by the province of Ontario in Canada, and by the state of New York in the United States.

The construction of the Saint Lawrence Waterway would make seaports of such United States cities as Buffalo, N.Y., Cleveland, Ohio, Detroit, Mich., Duluth, Minn., and Chicago, Ill. In Canada, Kingston and Toronto, Ontario, would become seaport cities. It is believed that eighteen states would benefit from the project and \$80,000,000 in transportation costs would be saved each year.

There is strong opposition to the plan both in Canada and the United States. In the United States the main opposition is from railways and public utilities. The railways fear that if the waterway were built, water traffic would greatly reduce rail transportation of trade products. The public utilities are against the project because the New York Power Authority Act provides that most of the power will be offered for sale to cities, farms, and small co-operative groups in competition with the private utilities. In Canada, the main opposition comes from the province of Ontario. The Ontario government claims that enough power is being produced by the Ontario Hydroelectric Commission to make it impractical for Ontario to spend \$67,000,000 for more power.

Though an agreement was reached in 1932, the United States Congress later refused to approve the treaty. It was turned down in the Senate in 1934 and again in 1945. In 1946 President Harry S. Truman announced his support of the treaty, and urged that it be adopted.

See also **INLAND WATERWAY; WELLAND SHIP CANAL.**

**SAINT LAZARUS, ORDER OF**, was a religious order of the Catholic Church founded in Jerusalem about 1150. Its purpose was to care for sick pilgrims, especially lepers. Branches were started in various parts of Europe, with the most important one at Boigny, France. The order was later merged into that of Our Lady of Mount Carmel. F.J.S.

**ST. LEGER, LEJ<sup>ur</sup>, BARRY** (1737-1789), was a British soldier who fought against the American colonists in the Revolutionary War. His defeat in the battle of Oriskany in 1777 and his retreat to Canada forced the British to change their original plans of battle.

St. Leger fought in the French and Indian Wars. During the Revolution he directed guerrilla fighting on the border. At the end of the war he was commander of the British forces in Canada. E.R.A.

**SAINT LOUIS**, *san loo E*, the capital city of Senegal. See **SENEGAL**.

**SAINT LOUIS**, *saynt LOO is*, Mo. (population 816,048), is a great Midwestern center of industry and trade. It owes its position as the eighth largest city in the United States to its location on the banks of the mighty Mississippi River. Pierre Laclède Liguette, a French fur trader, established his post here in 1764 because it was a handy point for the Indians living along the Mississippi and the Missouri rivers to reach with their fur-laden canoes. Later, when the paddle-wheeled steamboats moved up and down the Mississippi laden with goods from South and North, Saint Louis became one of the most important ports on the river shipping route. Today the river is still important to Saint Louis, although nineteen railroad lines and various air lines now help the river barges carry the incoming and outgoing commerce of the city.

#### Location, Size, and Description

Saint Louis lies on the Mississippi just below the mouth of the Missouri River. The center of the city is about eighteen miles downstream from the meeting point of the two great waterways. Saint Louis is about 300 miles southwest of Chicago; about 700 miles north

of New Orleans, and 600 miles southeast of Saint Paul.

The city covers an area of 61 square miles. It is shaped roughly like a fan, extending nineteen miles along the river front, and about six miles across the center. Along the river front, at what would be the handle from which the ribs of the fan would spread out, is a space in which the National Park Service began to build a memorial to Thomas Jefferson and other early American leaders in 1939. Many old buildings were torn down to make room for the memorial.

Beyond the memorial grounds are first the city's retail business district, and then the wholesale district. Running out from the business districts like the ribs of a fan are several boulevards and fast motor trafficways. One of these, Lindell Boulevard, runs west from the center of the city and ends at the campus of Washington University. Another, Market Street, runs southwest to an express highway at the western city limits.

Between the various boulevards are the residential streets, lined for the most part with attractive homes. Three out of every ten families in Saint Louis own their own homes, and the city is noted for the attractiveness of most of its residential districts.

On the edge of the city limits, and extending into suburbs beyond, are a number of industrial districts.

On the Missouri side of the Mississippi, Saint Louis has a number of suburban communities. The largest of these are University City, Clayton, Maplewood, Webster Groves, and Kirkwood. Across the Mississippi, in Illinois, are several cities which are regarded as part of the Greater Saint Louis area. These include East Saint Louis, Alton, Venice, Granite City, and Belleville.

Six large bridges connect the Illinois communities with Saint Louis. The largest of these are the Eads Bridge, one of the first permanent bridges across the Mississippi, and the MacArthur Bridge, connecting Saint Louis with East Saint Louis. See **EADS BRIDGE**.

#### Cultural Life

**Education.** Saint Louis has always been proud of its public-school system. The first public-school kindergarten in the United States was founded here in 1873 by Susan Blow. In addition to the public system, there are excellent Roman Catholic and Lutheran parochial schools, and a number of private grammar schools.

Two city high schools, Hadley and Washington (for Negroes), are devoted entirely to training in various skilled trades. The city also operates Harris Teachers College, founded in 1854 and one of the oldest teacher-training institutions west of the Mississippi, and Stowe Teachers College (for Negroes).

The city has two universities. Washington University, a privately endowed coeducational institution, has an exceptionally beautiful campus at the western edge of the city. Saint Louis University is a Roman Catholic institution operated by the Society of Jesus. It is an outgrowth of a preparatory school opened in 1818, and thus can claim to be the oldest university west of the Mississippi.

**Churches.** Saint Louis is the seat of a Roman Catholic archdiocese and a Protestant Episcopal diocese. The city has hundreds of churches representing nearly every religious group.

## SAINT LOUIS



**Warrior and His Winged Horse** guard the entrance to the Soldiers Memorial. The Civil Courts Building is on the right.

**Kingshighway Boulevard**, opposite Forest Park, runs through the hotel and apartment district in western Saint Louis.

**The Sunken Gardens in the Heart of Town.** On the right is the Public Library. In the center is Christ Church Cathedral.



**The Million-Dollar City Art Museum** crowns Art Hill in Forest Park. The statues on the portico represent the six great

periods of art. On the left of the entrance is "Painting," by Saint-Gaudens, and on the right is "Sculpture," by French.

**The Arts.** The Saint Louis Symphony Orchestra is one of the most famous musical organizations in the United States. This orchestra is maintained by the Symphony Society, which began as a choral group in 1880. The city has one theater for professional stage performances, and another maintained by the Saint Louis Little Theater group for amateur performances. The Saint Louis Art Museum has a number of fine paintings, and sponsors the American Artists Exhibit each year.

**Parks.** Forest Park (1,400 acres), is second in size only to New York's Central Park. Forest Park extends from the center of Saint Louis along Kingshighway to Skinker Boulevard, at the western city limits, a distance of three and one-half miles. The park has areas of great natural beauty, winding drives, golf links, playgrounds, and picnic areas. The Louisiana Purchase Exposition of 1904 was held in this park, and all the drives, lagoons, and waterfalls built for the exposition have been preserved. The Saint Louis Art Museum, at the top of Art Hill, was built to house the art treasures shown at the exposition. In front of the museum is a huge statue of King Louis IX of France (Saint Louis), for whom the city was named. Near by is the Jefferson Memorial, built with funds left over from the exposition.

The Forest Park Zoo is one of the finest zoological gardens in the United States. The Jewel Box is a large greenhouse where exhibitions of flowers are held throughout the year. Also located in Forest Park is the Municipal Opera, an open-air theater seating 10,000 persons, where light-opera programs are presented each night during the summer months.

Saint Louis has three other large public parks, Fair Grounds, Carondelet, and Tower Grove, and a number of smaller parks.

The Missouri Botanical Garden, popularly known as "Shaw's Garden," is open to the public without charge, but it is not a public park. It is a private institution founded by Henry Shaw. More than 12,000 kinds of plants from all parts of the world may be seen here.

**Other Interesting Places to Visit** in Saint Louis include:

**Aloe Plaza**, on Market Street between Eighteenth Street and Twentieth Street. This plaza contains the famous "Wedding of the Rivers" fountain designed by the noted sculptor, Carl Milles. It is planned to connect this plaza with *Memorial Plaza* (see below) by removing the buildings between.

**Eugene Field House**, 634 South Broadway. This three-story red brick dwelling was the home of the children's poet who wrote the beloved "Little Boy Blue."

**Memorial Plaza**, on Market Street between Twelfth Street and Sixteenth Street. The plaza contains memorial buildings to the heroes of World Wars I and II. Grouped around the plaza are most of the public buildings of Saint Louis. At the eastern end, on Twelfth Street, is the tall Civil Courts Building and the United States Court House. On the south side of Market street are the old-fashioned City Hall and Municipal Courts Building, and the very modern *Kiel Auditorium*, built and owned by the city. The auditorium contains an opera house with seats for 3,800 persons, and a convention hall that will hold 10,000 persons. North of the plaza is the *Saint Louis Public Library*.

**Union Station**, on Market Street between Eighteenth Street and Twentieth Street. In terms of the number of trains and the number of passengers it can handle at

one time, this is one of the largest railroad passenger stations in the world.

### Industry and Trade

Saint Louis is the largest raw-fur market in the world. Valuable skins from all parts of the world are sent here to be processed and sold to furriers throughout the United States to be made into garments and trimmings. The city is also a leading grain and livestock market. There is a brisk wholesale trade in such products as bags, carpets, coffins, doors, chemicals, trunks, steel castings, lumber products, and sugar-mill machinery.

Saint Louis manufactures include shoes, drugs, bricks, terra cotta tile, macaroni, stoves and ranges, enamelware, and streetcars. During World War II, Saint Louis industries were converted to war production, and the city's arms plants included one making small-arms ammunition, one making gun turrets, two aircraft plants, and about 200 factories which made other war materials.

### Government

Saint Louis is one of the few communities in the United States that is both a city and a county. In 1875 the city, with its present boundaries, was separated from Saint Louis County and given the functions of a county itself. As a city it has a modern and progressive "home rule" government which may be changed at any time by a vote of the people. But it also has a system of county officers, such as a sheriff, prosecuting attorney, and registrar of property deeds. This arrangement has kept Saint Louis from annexing its suburbs, since this would transfer them from one county to another.

Unlike most cities, Saint Louis does not control its own police department and department of elections. These are managed by boards of commissioners appointed by the governor of Missouri.

### History

Pierre Laclède Ligueste and his stepson, Auguste Chouteau, established their trading post, called Laclède's Village, at the time when French territory east of the Mississippi River was being transferred to Great Britain, and that west of the river to Spain. French settlers in the Illinois country, east of the river, preferred to live under Spanish rather than British rule. They crossed the river and settled around Laclède's trading post. See CHOUTEAU.

On March 10, 1804, the transfer of the northern part of the Louisiana Purchase to the United States took place in Saint Louis. On that day the flags of three nations floated over the village.

During its first ten years as an American town, Saint Louis became important as the center of exploration of the Northwest and of the fur trade. Saint Louis was the starting point of the exploring expeditions of Lewis and Clark and Zebulon M. Pike. The American Fur Company of Saint Louis sent adventurous traders and trappers into the heart of the Rocky Mountain country. The keelboats, and later the steamboats, went up the Missouri River and its tributaries and returned with cargoes of furs. Saint Louis was also the eastern terminus of traffic over the Santa Fe Trail.



During the 1850's, Saint Louis was chosen for settlement by a large number of Germans who had fled their homeland because of political persecution after the Revolution of 1848, or because they objected to compulsory military service. The descendants of these immigrants still form a large part of the city's population.

In 1849 many Easterners who joined in the California gold rush bought their mining outfits and supplies at Saint Louis. The city was also the outfitting point for the overland migration to Oregon.

During the War between the States, Saint Louis was divided against itself, with about as many citizens favoring the Union side as those who sided with the South. One of the earliest skirmishes of the war, the capture of Camp Jackson, took place here.

After the war, the building of the railroads and the expanding trade of the Southwest brought steady growth to Saint Louis.

During both World Wars I and II the factories of Saint Louis produced large quantities of war materials for the armed forces. Thousands of men were trained at Jefferson Barracks, an army installation south of the city that has been an important outpost, training center, or supply base in every war since the post was founded in 1826.

S.A.J.

#### Questions

To what natural advantage does Saint Louis owe its importance among American cities today?

What famous American poet once lived in Saint Louis?

In what trade does Saint Louis lead the world?

How is the governmental organization of Saint Louis unusual?

Why has the city not been able to annex its suburbs?

Who first established a settlement where Saint Louis stands today? Why did many Frenchmen move into this settlement?

**SAINT LOUIS RIVER.** See SAINT LAWRENCE RIVER.

**SAINT LOUIS UNIVERSITY** is a coeducational school in St. Louis, Mo. It is controlled by the Catholic Church, but students of all faiths are admitted. Divisions of the university include the schools of arts and sciences, philosophy, divinity, medicine, dentistry, nursing, law, commerce and finance, geophysical technology, social service, and social sciences, the University College, and the Graduate School. Its medical school, dental school, school of nursing, hospitals, and clinics make up the largest Catholic medical center in the world. The university was founded in 1818 and is the oldest university west of the Mississippi River. It has an average enrollment of about 7,000.

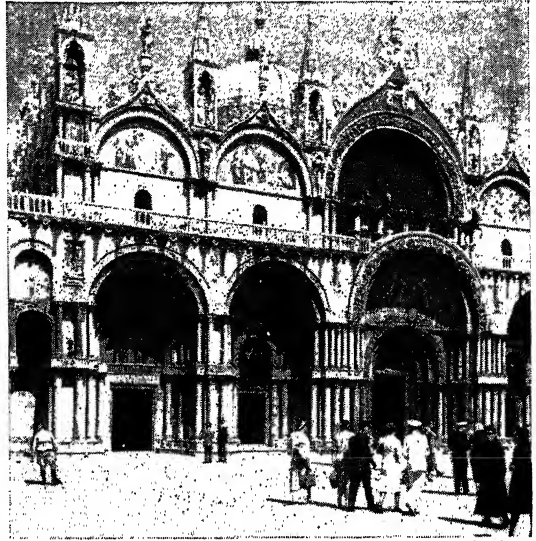
P.J.H.

**SAINT LUCIA, LU shih ah.** See WINDWARD ISLANDS.

**SAINT MARK, CATHEDRAL OF,** is a famous Catholic church in Venice, Italy. It is named for Mark the Evangelist, the patron saint of the city. The first church in honor of Mark was built in the 800's on the ground now occupied by the cathedral. It was destroyed by fire, and a new church was built in the 900's. The second church was planned as a simple building. Beginning about 1050 a new structure was built and embellished until it became one of the most gorgeous buildings in the world. It is very rich in color—white, blue, red, brown, and gold.

In the days of the republic of Venice, a law compelled every merchant who traveled to the Orient to carry back something from the East for the church. The collection of art objects in the church became as large as the exhibits contained in many museums.

The church faces the Square of Saint Mark, the celebrated civic center of Venice. The building is in the form of a Greek cross, 250 feet long, and 220 feet wide in the widest part. The style of architecture is mainly Byzantine, with domes and cupolas. A dome forty-two feet in diameter stands over the center of the church. A smaller dome is built over each one of the arms of the



Gendreau

**The Cathedral of Saint Mark in Venice, Italy,** was founded about A.D. 829 when Venetian merchants purchased the relics of Saint Mark from the Egyptians. The façade is decorated with mosaics of different periods, and religious statues.

cross-shaped structure. Five portals with rich frames lead to the vestibule from the square. Four famous antique horses of bronze stand over the center door. The horses were brought to Venice from Constantinople in 1204. The famous campanile of Saint Mark stands near the cathedral. See CAMPANILE.

The inside of the church is decorated chiefly with mosaics set in a gold background. The arches and vaulting are so arranged that the beautiful designs on them can be easily seen. The cathedral holds marble statues of Mary, Saint Mark, and the Twelve Apostles, in addition to many other works of marble and bronze. The screen above the altar, displayed at certain seasons of the year, contains hundreds of precious stones, and is one of the most gorgeous pieces of gold, silver, and enamel work in the world.

Saint Mark's was formerly the royal chapel of Italian kings and queens. But since 1807 it has been open to the public and is now the cathedral of Venice. K.J.C.

**ST. MARTIN'S COLLEGE** is a men's school at Lacey, Wash. It is controlled by the Catholic Church, but students of all faiths are accepted. Courses are offered in the liberal arts, business administration, premedicine, pre-law, and pre-engineering. The college was founded in

1895 and has an average enrollment of about 200.

**SAINT MARTIN'S SUMMER.** See INDIAN SUMMER.

**ST. MARY COLLEGE** is a liberal arts school for women in Leavenworth, Kan. It is controlled by the Catholic Church. Courses lead to the A.B. and B.S. degrees. Saint Mary College was established in 1866, and has an average enrollment of about 350.

**SAINT MARY OF THE SPRINGS COLLEGE** is a women's school in Columbus, Ohio. It is controlled by the Catholic Church, but students of all faiths are admitted. Courses are offered in all the major departments. The Erskine Lectures, which have gained a national reputation, are sponsored by the college. The college was founded in 1911 and has an average enrollment of about 140. SR.M.

**ST. MARY-OF-THE-WASATCH, COLLEGE OF,** is a liberal arts school for women in Salt Lake City, Utah. It is controlled by the Roman Catholic Church. Courses lead to the A.B. and B.S. degrees. The school was founded as Saint Mary's Academy in 1895, and given its present name in 1926. It has an average enrollment of about 120.

**SAINT MARY-OF-THE-WOODS COLLEGE** is a women's school at St. Mary-of-the-Woods, Ind. It is controlled by the Catholic Church. Courses are offered in the liberal arts and physical and bacteriological sciences. The college was founded in 1840 and is the oldest Catholic women's college in Indiana. It has an average enrollment of about 300. SR.E.L.

**SAINT MARY'S COLLEGE** is a liberal arts school for men at Winona, Minn. It is controlled by the Brothers of the Christian Schools, a Roman Catholic lay organization. Courses are offered leading to the degrees of A.B., B.S., and B.S.S. St. Mary's was founded in 1912 and has an average enrollment of about 350.

**ST. MARY'S COLLEGE** is a men's school near Oakland, Calif. It is controlled by the Catholic Church. Courses are offered in liberal arts, economics, sciences, prelaw, premedicine and pre dentistry. Out-of-town students live in three residence halls on the campus. Students may be helped to pay their way by part-time employment. The college was founded in 1863 in San Francisco and has an average annual enrollment of about 550. BRO.A.

**SAINT MARY'S COLLEGE, NOTRE DAME, HOLY CROSS,** is a liberal arts school for women near South Bend, Ind. It is controlled by the Catholic Church, but students of all races and faiths are accepted. Courses in the arts, sciences, music, and nursing lead to bachelor's degrees. The college was founded in 1844 and was the first Catholic college in the United States to grant degrees to women. It has an average enrollment of about 600. SR.M.MADELEV.

**SAINT MARYS RIVER.** See FLORIDA (Physical Features).

**SAINT MARYS RIVER** is the stream that carries the waters of Lake Superior into Lake Huron. It is about forty miles long, and forms a part of the boundary between Ontario and the Upper Michigan Peninsula. A number of islands divide the river into two main channels, and each channel spreads out into several lakelike bays. The Saint Marys Rapids are near the upper end of the river. Here there is a fall of nearly twenty feet within

a mile. Canals and locks have been constructed on both the Canadian and American sides so that ships can get around St. Marys Rapids. The canals are known by two names, the Saint Marys Canals, and the Sault Sainte Marie, or Soo, Canals. The rapids furnish power for manufacturing. They are crossed by a railroad bridge a mile long. L.D.JR.

**SAINT MAURICE, *san moh* REES, RIVER.** See QUEBEC (Rivers, Waterfalls, and Lakes); SAINT LAWRENCE RIVER.

**SAINT MICHAEL, FEAST OF.** See MICHAEL, SAINT.  
**ST. MICHAEL'S COLLEGE** is a men's school in Winookski Park, Vt. It is controlled by the Catholic Church, but students of all faiths are admitted. Courses are offered in biology, chemistry, pre dentistry, pre medicine; pre theology, physics, mathematics, business, English, education, French, German, history, library, sociology, religion, and philosophy. The college was founded in 1904 and has an average enrollment of about 300.

**ST. MICHAEL'S COLLEGE** is a coeducational Catholic school in Toronto, Ontario, Canada. It is part of the University of Ontario. Courses are offered in the liberal arts and business. There is also a five-year high-school course which prepares for entrance to the university. The school was founded in 1852 and has an average enrollment of about 200. R.J.S.

**SAINT MIHEL, *san mee* TEL.** See WORLD WAR I (Drive toward Metz; Americans in Battle).

**SAINT MORITZ, *saynt* MO ritz.** See SWITZERLAND (Cities).

**SAINT NICHOLAS.** See NICHOLAS, SAINT.

**ST. NORBERT COLLEGE** is a liberal arts school for men, at West De Pere, Wis. It is controlled by the Catholic Church, but students of all faiths are admitted. The college was founded in 1898 and has an average enrollment of about 350. G.C.C.

**ST. OLAF COLLEGE** is a coeducational liberal arts school in Northfield, Minn. It is controlled by the Lutheran Church. The college is the home of the famous St. Olaf Lutheran Choir. St. Olaf was founded in 1874 and has an average enrollment of about 1,100. G.M.G.

**SAINT PATRICK'S CATHEDRAL.** See CATHEDRAL (illustration); NEW YORK CITY (Churches).

**SAINT PATRICK'S CROSS.** See FLAG (color plate, Flags of British Commonwealth of Nations).

**SAINT PATRICK'S DAY.** See PATRICK, SAINT.

**ST. PATRICK'S SEMINARY** is a Roman Catholic theological seminary in Menlo Park, Calif. It has an average enrollment of about 100.

**SAINT PAUL,** Minn. (population 287,736), is one of the "Twin Cities." Its sister city, Minneapolis, joins Saint Paul on the west. Saint Paul is the capital of Minnesota. Railway cars and Mississippi River freight barges bring many tons of products to the city every day for trade or for manufacture. The largest law-book publishing concern in the United States is in Saint Paul. The city also is the home of one of the biggest calendar and advertising novelty factories in the country.

#### Location, Size, and Description

Saint Paul lies in eastern Minnesota, about 400 miles northwest of Chicago. Most of the city is situated on the north bank of the Mississippi River. Saint Paul stretches



Kenneth M. Wright

**The Skyline of St. Paul, Minn., as It Appears from the High Bridge Spanning the Mississippi River**

along three terraces, which rise hundreds of feet above the water. The first terrace contains railroad yards and factories. The second terrace contains the business section. The third and highest terrace is occupied by homes. The state Capitol, built of white marble and native granite, stands on a hill overlooking the city. Paintings on the inside walls of the building picture incidents in the history of the state. The city hall and courthouse are combined in one modern building. The main hall of the building is a memorial to soldiers and sailors killed in World War I. A famous statue of an Indian by the sculptor Carl Milles stands in the hall.

Other important buildings in the city include the new Federal building, the public library, the Catholic Cathedral, the Minnesota Historical Building, and the Municipal Auditorium. In 1928 the city spent \$16,000,000 in improving the city by building new bridges and widening the streets. The Minnesota State Fair Grounds are in Saint Paul.

#### **Cultural Life**

The city is the home of Concordia College (German-Lutheran), Hamline University (Methodist), Macalester College (Presbyterian), Saint Paul Seminary (Catholic), Saint Paul College of Law, the College of St. Catherine (Catholic), and Saint Thomas College (Catholic). The state agricultural college, part of the University of Minnesota, is in Saint Paul. The city has been the see of the Catholic archbishop of Minnesota since pioneer days.

**Recreation.** Most of the boulevard system of the city is built along the river bank. Kellogg Boulevard extends for a mile along the downtown river front. The parks, drives, and playgrounds cover about 2,000 acres in the city. There are many fine golf courses. Como and Phalen parks contain small lakes. There are thirty other lakes near the city.

#### **Industry and Trade**

Factories in Saint Paul make refrigerators, fur goods, meat and food products, and machinery. The city is an

important wholesale center. The processing of mushrooms, which are grown in caves along the river, is an important industry in Saint Paul. There is a large automobile plant on the river bank. It obtains its power from the government lock and dam on the Mississippi River. Glass for automobile windows is manufactured from sand which lies near the factory. Many of the products brought here for trade come on the Mississippi River barges that dock at the river harbor.

#### **History**

Father Louis Hennepin, a missionary explorer, visited the site of Saint Paul in 1680. In 1805 Lieutenant Zebulon M. Pike was sent to explore the territory, which had been acquired by the Treaty of Paris. He made a treaty with the Sioux Indians and obtained a land grant. About fifteen years later Fort Snelling was built about five miles from the site of Saint Paul. The first settler was a French Canadian trader nicknamed "Pig's Eye." The first settlement was named Pig's Eye. The name was changed in 1841 when a small log chapel was built by Father A. Ravoux on what is now Kellogg Boulevard and Minnesota Street. The chapel was dedicated to Saint Paul. The place was known as Saint Paul's Landing for many years before it received its present name. Oxcart trade in furs and buffalo meat was shipped along the Mississippi from the Red River Valley to Saint Paul for many years. Later, Scandinavians, Irish, Germans, and French settled in the city.

Saint Paul became a village and capital of the territory when Minnesota was made a territory in 1849. The city received its charter in 1854. It continued as the state capital when Minnesota was admitted to the Union. Saint Paul adopted the commission form of government on January 1, 1914.

G.L.N.

See also COMMISSION FORM OF GOVERNMENT.

**SAINT PAUL DE LOANDA**, *lo AHN dah*, or **SÃO PAULO DE LOANDA**. See ANGOLA.

**SAINT PAUL ISLAND**. See PRIBILOF ISLANDS.

**SAINT PAUL'S CATHEDRAL**. See LONDON.

**SAINT PETERSBURG**. See LENINGRAD.

**SAINT PETERSBURG**, Fla. (population 60,812), is the fourth largest city in the state and second in size only to Miami among winter resorts of Florida. Saint Petersburg is often called the "Sunshine City" because of the excellent climate of the region. The city was named for Saint Petersburg (now Leningrad), Russia. Saint Petersburg lies on the western Florida coast, covering the southern tip of the peninsula that separates Tampa Bay from the Gulf of Mexico. Gandy Bridge, seven miles long, shortens the land journey from Tampa to the southwest.

Saint Petersburg has a twenty-eight mile beach, a million-dollar recreation pier, several sanitariums, and hundreds of hotels and apartment buildings. The tourist trade gives the city more than \$50,000,000 worth of business every year. Saint Petersburg has a large fishing industry. It is a market for truck-garden products and citrus fruits grown near by. An excellent harbor can accommodate large steamships. The city is served by railway and air lines. The Saint Petersburg Coast Guard Air Station covers 84 acres on the shore of Tampa Bay.

The peninsula was first settled in 1843 by Antonio Maximo, who started a fishing industry. But his holdings were destroyed by hurricanes. The oldest house in the city today dates back to 1856. Modern Saint Petersburg was established by John Williams and Peter Devens, a Russian engineer who built the first road into town in 1888. Saint Petersburg was incorporated as a city in 1892. K.T.A.

**SAINT PETERSBURG COAST GUARD AIR STATION.**  
See SAINT PETERSBURG.

**SAINT PETER'S CHURCH** is the largest Christian church in the world. It stands in Vatican City, Rome. The building was begun in 1506 over the tomb or *crypt* which is believed to contain the tomb of Saint Peter. The crypt is part of an earlier church built by Constantine the Great between 323 and 326. Before that, the Circus of Caligula and Nero stood in the same place.

**Saint Peter's Church in Vatican City, Rome**, is built on the site of the Roman Circus of Nero. This magnificent church stands

According to legend, many early Christian martyrs were put to death there.

Ten architects worked on Saint Peter's during the many years it took to build the church. The first was Donato Bramante. The most important was Michelangelo, who took charge in 1547, and continued for eighteen years. (See MICHELANGELO BUONARROTI.) The building was dedicated in 1626 by Pope Urban VIII, but other parts were added later.

Saint Peter's floor plan is in the shape of a cross. The entire length is 718 feet. At the widest part it measures 450 feet. The great hall or nave is 150 feet high. The dome, designed by Michelangelo, rises over 400 feet and is 138 feet across. One can climb inside the curve of the dome to the upper cupola and the cross. Beneath the dome stands the chief altar. Giovanni Bernini designed its great bronze canopy, which is 95 feet high. Only the Pope or an authorized cardinal may hold service there. The inside of the church is richly decorated with marble, gilding, and mosaics. Around the walls are chapels, altars, and tombs. The central bronze doors belonged to the old church.

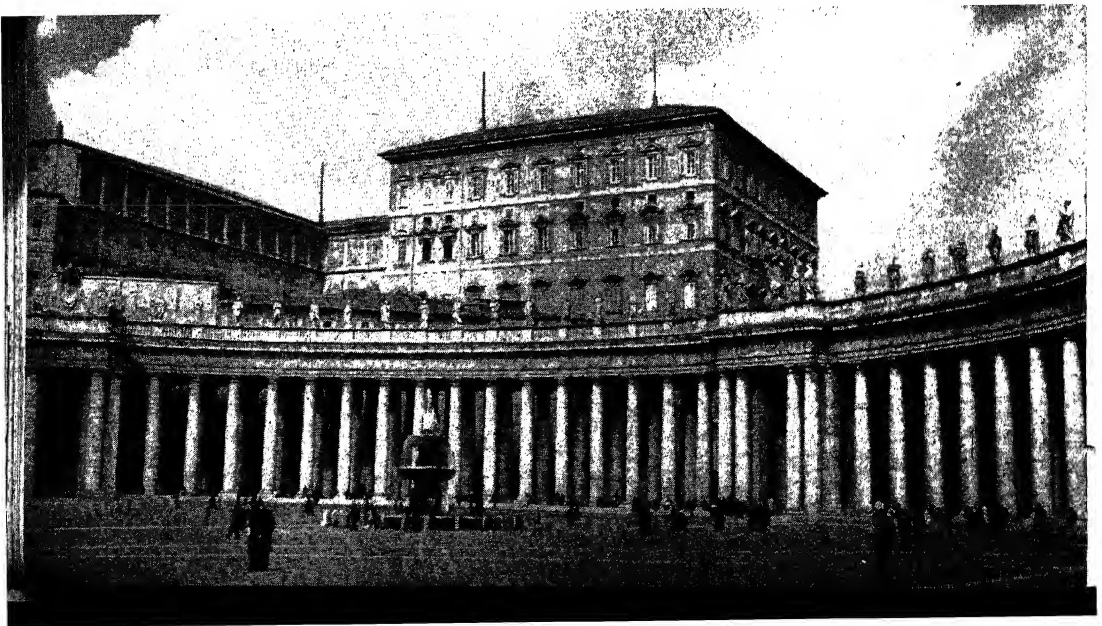
In front of the church there is a large open space called the Piazza di San Pietro. On each side of the Piazza are covered driveways. In the center stands a red granite shaft, called an *obelisk*, which is 80 feet high. This obelisk was brought from Egypt in the first century. It was not moved to the Piazza until the 1500's.

The total cost of Saint Peter's is believed to be about \$50,000,000. Over \$30,000 is spent each year to repair and take care of it. The men who do this work live in small houses on the roof. K.J.C.

See also BRAMANTE, DONATO; PETER, SAINT; ROME (Religion); VATICAN.

**SAINT PETER'S COLLEGE** is a men's school in Jersey City, N.J. It is operated by the Jesuits. Courses are offered in all the major departments. The school was founded in 1878. Its enrollment averages 400. J.E.C.

as a tribute to Saint Peter and many other Christians who died in the Circus for their religious beliefs.



**E, san-PYAIR, JACQUES HENRI BERNARDIN DE** (1737-1814), was a famous French nature writer and novelist. His most noted work was the sentimental romance, *Paul and Virginia*. This book was inspired by Jean Jacques Rousseau's doctrine of "Back to Nature," and relates the childhood of a boy and girl in an ideal woodland. See ROUSSEAU, JEAN JACQUES.

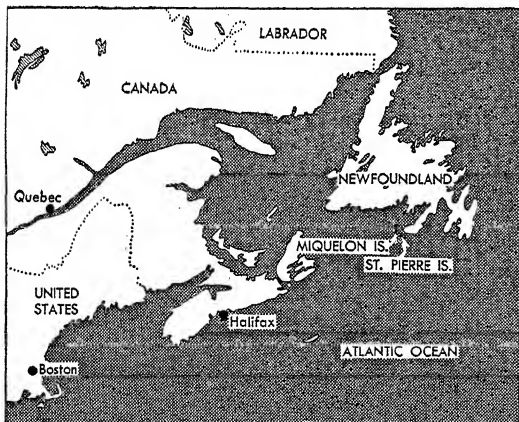
Saint-Pierre was born in Le Havre. He studied engineering at the College of Rouen and then enlisted in the army as a military engineer. Some time later he resigned from the army and went to Russia, where he worked for four years as an engineer. Saint-Pierre worked for another three years in Mauritius as a government engineer, and then returned to France in 1771.

In Paris he met Rousseau, who inspired him to write *A Voyage to the Isle of France*. Rousseau, who did not believe in Christianity, admired the book for its naturalness, while the bishop of Aix admired it for its reverence. This bishop obtained for Saint-Pierre a yearly pension of \$200 from the French government. With this income Saint-Pierre was able to give up engineering and to devote all of his time to writing.

L.J.

His Works include *Studies of Nature* and *The Indian Cottage*.

**SAINT PIERRE, AND MIQUELON, mik eh LAHN**, are small French islands about ten miles south of Newfoundland. They are the only land left to the French in



Location Map of Saint Pierre and Miquelon Islands

North America. The islands cover an area of ninety-three square miles, and have an estimated population of 4,120.

The islands are barren and rocky, and are important only as a French fishing center. During the fishing season, the islands export many tons of codfish. The chief island town is Saint Pierre. The town has a good harbor, and ships from many parts of the world tie up at its wharves.

France first occupied the islands in 1635. England and France controlled the islands in turn until 1814, when France took final possession. Fighting French troops held Saint Pierre and Miquelon during World War II.

W.E.E.

**ST. ROSE, COLLEGE OF**, is a women's school in Albany, N.Y. It is controlled by the Catholic Church, but students of all faiths are admitted. Courses are

offered in the liberal arts and sciences. The school was founded in 1920 and has an average enrollment of about 450.

SR.G.L.

**SAINTS.** See SAINT and the list of Saints in the BIOGRAPHY section of the READING AND STUDY GUIDE.

**SAINT-SAËNS, san-SAHNS, CAMILLE** (1835-1921), was a French composer. He was born in Paris, and at the age of thirteen he became a student at the Conservatory there. His first symphony was performed when he was sixteen years old. Two years later he was appointed organist in a Paris church. From 1861 until 1877 he served as organist in the Madeleine Church of Paris.

In 1877 Franz Liszt produced Saint-Saëns' Biblical opera *Samson and Delilah* at Weimar. The opera houses of Paris had repeatedly refused to play it, and it was not heard there until fifteen years later.

In 1886 Saint-Saëns composed a "zoological fantasy," "Carnival of Animals," for two pianos and orchestra. In this piece, with an engaging sense of humor, he used the piano and other instruments to describe the elephant, kangaroo, cuckoo, swan, lion, and other animals. Among his numerous compositions in all forms is the symphonic poem "Danse Macabre."

G.B.

**ST. SCHOLASTICA, COLLEGE OF**, is a women's school at Duluth, Minn. It is controlled by the Catholic Church, but students of all faiths are admitted. Courses are offered in all the major departments. The school was founded in 1912 and has an average enrollment of about 150.

SR. M.Dr.

**SAINT-SIMON, saynt-SI mun, or san-see MAWN, CLAUDE HENRI DE ROUVROY, COMTE DE** (1760-1825), was the founder of French socialism. He was born in Paris of an old and noble family and studied under Jean d'Alembert. His ambition from early youth was to work for the betterment of mankind. He wanted to bring about a new society, with work as its basis, and science as its guiding principle.

Saint-Simon dreamed of a state in which every one would have to work, and each would receive rewards equal to his labor. In this state goods would be produced for use and not for profit. No person would be allowed to inherit wealth and everyone would start life on an equal basis. His rather vague and confused teachings were later formed into a socialistic system known as Saint-Simonism.

Saint-Simon went to America in his youth and fought in the Revolutionary War. He served with bravery in the campaign against Lord Cornwallis. He took no active part in the French Revolution, but was imprisoned for a short time. He made a fortune by buying and selling the estates of nobles who were driven from France during the Revolution, but later lost it.

A.M.



Brown Bros.

**Camille Saint-Saëns** was one of France's best modern composers.



**SAINT SOPHIA**, so *FE ah*, is the finest and most famous example of Byzantine architecture in the world. It was built as a Christian cathedral by Justinian the Great between A.D. 532 and 537 in Constantinople (now Istanbul). A new dome, higher than the first one, was added between 558 and 563. The building was used as a mosque, or Moslem temple, after 1453 when the Turks conquered the city. Many Mohammedans used to call it the Mehmedie Mosque. Since 1933, Saint Sophia has served as a museum.

The inside appearance is one of great space, height, and richness. The rare and costly building materials were brought from many parts of the Roman Empire. The walls are lined with marble in many colors and designs. The vaults are decorated with mosaics. These were covered over by the Turks. After the building became a museum, the mosaics were uncovered. This work was aided by the Byzantine Institute of America. Many beautiful pictures were found. Among these are figures of Christ, the Virgin Mary, the Archangel Gabriel, and a number of portraits of rulers and officials. None of the original church furnishings is left. Some of the Turkish furnishings still remain. These include the prayer niche, or *mihrab*, and the pulpit, or *mimbar*.

The floor plan is oblong. The building measures 250 feet from east to west and 235 feet from north to south. The central hall, or *nave*, is separated from the aisles by two piers and eight columns on each side. Over the center rises the great dome, 185 feet high and 107 feet across. It is shaped like a huge parachute. In its base are 40 arched windows. The dome is directly supported by four great vaults, shaped like triangular kites and called *pendentives*, which rest on piers. Beneath the dome are two large half domes extending east and west. Each half dome rests on two smaller half domes. Beneath the eastern half domes projects a niche called the *apse*. The entrance arch is beneath the small half domes at the western end.

On the outside are four towers, or *minarets*, one at each corner. These were added by the Turks when Saint Sophia was used as a mosque. The rest of the outside resembles a group of bubbles, and is much less pleasing than the inside. K.J.C.

See also **BYZANTINE ARCHITECTURE**; **CATHEDRAL**.

**SAINTS PETER AND PAUL, CATHEDRAL OF**, is an Episcopal church in Washington, D.C. It stands on Mount Alban overlooking the city. The building of the Cathedral was begun in 1907, and it will probably take more than fifty years in all to complete the structure. But services have been held in some of the chapels since 1912. The cathedral is built in the shape of a cross, 525 feet in length and 275 feet in its greatest width. The style of the architecture is Gothic of the Middle Ages, with pointed arches and vaulted ceilings. The church is noted for its rich carvings and beautiful stained-glass windows.

Some of the historic stones included in the Church are from Solomon's quarry in Jerusalem, from a tomb along the Appian Way in Rome, from the city of Isabella on Santo Domingo Island (discovered by Columbus), and from Glastonbury Abbey, England, which is thought to be the burial place of King Arthur and Queen Guinevere. The foundation stone was brought

from Bethlehem, Christ's birthplace in Palestine.

Many of America's famous dead will be entombed in the Cathedral of Saints Peter and Paul. Some of those now buried in the Cathedral are Woodrow Wilson, twenty-eighth President; Admiral Dewey, hero of the Spanish-American War, and his wife; Melville Stone, founder of the Associated Press; and Bishop Satterlee, who chose the present location of the church.

See also **CATHEDRAL**.

K.J.C.

**SAINT SWITHIN'S DAY**, the feast day of that saint, is July 15. He was bishop of Winchester and the trusted counsellor of Egbert, King of the West Saxons, who had him made bishop about 852. St. Swithin's name is connected with this rhyme:

St. Swithin's day if thou dost rain  
For forty days it will remain;  
St. Swithin's day if thou be fair,  
For forty days 'twill rain nae mair.

F.J.S.

See also **SWITHUN**, OR **SWITHIN**, **SAINT**.

**ST. TERESA, COLLEGE OF**, is a liberal arts school for women at Winona, Minn. It is conducted by the Catholic Sisters of Saint Francis. Courses lead to the A.B. and B.S. degrees. The school was founded in 1910 and has an average enrollment of about 800.

**SAINT THOMAS**. See **VIRGIN ISLANDS**.

**ST. THOMAS, COLLEGE OF**, is a men's school at St. Paul, Minn. It is controlled by the Catholic Church, but students of all faiths are admitted. Courses are offered in all the major departments of the liberal arts. Out-of-town students live in dormitories or approved houses. The school was founded in 1885 and has an average enrollment of about 800. V.J.F.

**SAINT VALENTINE'S DAY**. See **VALENTINE, SAINT**.

**SAINT VINCENT** is a mountainous island in the British West Indies. It is one of the Windward Islands. Saint Vincent covers an area of 150 square miles. About half of the land is covered with forests. The valleys are fertile. Volcanic eruptions have twice destroyed many parts of the island.

Saint Vincent has a healthful climate in spite of its heavy tropical rainfall. The chief products are arrowroot, cocoa, cotton, tropical fruits, and spices. The sea-island cotton produced here is among the best of its kind in the world. The capital of the island is Kingstown (population 4,269). The total population of the island is 47,961. Most of the inhabitants are Negro descendants of freed slaves. E.E.Et.

**SAINT VINCENT, CAPE**, is the farthest southwest point of land in the province of Faro, Portugal. An important naval battle was fought off Cape Saint Vincent between the British and the combined French and Spanish fleets in 1797. Sir John Jervis beat the French and Spanish in their attempt to lift an English blockade of French ports. For his feat the admiral was named Earl Saint Vincent. H.U.S.

**ST. VINCENT COLLEGE** is a liberal arts school for men at Latrobe, Pa. It is controlled by the Catholic Church, but students of all faiths may enroll. The college offers work leading to degrees in the classical, prelegal, pre-engineering, premedical, premedical, chemistry, sociology, business, teacher-training, and music fields. The college has an average enrollment of about 300. A college-preparatory school with an enrollment

of about 200 and a seminary with about 100 students are located on the campus. St. Vincent was founded by the pioneer Benedictine missionary, Boniface Wimmer, in 1846.

**SAINT VITUS'S DANCE**, or **CHOREA**, *ko RE ah*, is a nervous disease that most commonly attacks children between the ages of five and fifteen, especially girls. It is characterized by muscular jerking of the face, neck, arms, hands, and various other parts of the body. It may be brought on by overstudy, worry, lack of outdoor exercise, late hours, fright, and shock. The disorder is closely related to rheumatism, and rheumatic heart disease is likely to accompany it or follow it.

The specific cause of the disease is a germ that affects the brain and spinal cord, and the disorder is frequently associated with diseased tonsils. Saint Vitus's dance in its ordinary form is seldom fatal. An attack may last from six weeks to six months, and the disease tends to recur if proper precautions are not taken. Rest in bed, good food, relief from worry or mental exertion, and cold baths are among the measures used in combating the disease. Physicians also prescribe tonics. Any child afflicted with Saint Vitus's dance should be taken out of school.

The importance of Saint Vitus's dance arises partly out of its relation to heart disease. Children should be protected against it as a measure of protection for their hearts. Their tonsils and teeth must be put in order, and other sources of infection removed. They should get plenty of milk to supply lime, and an abundance of eggs, meat, and vegetables for iron and vitamins. Children must not be allowed to become anemic. Fatigue from overwork, overplay, and lack of sleep are to be avoided. Children with Saint Vitus's dance should be carefully watched as to the condition of the heart.

The term *chorea* is derived from a Greek word meaning *dance*. The other and more common name has come into use through associating the disease with a form of hysteria which prevailed in central Europe in the 1500's. Cures for this hysteria were sought at the shrines of Saint Vitus.

H.R.V.

**SAINT XAVIER COLLEGE** is a women's school in Chicago. It is controlled by the Catholic Church. Courses are offered in the liberal arts and in nursing. The college was founded in 1915 and has an average enrollment of about 380.

SR.M.HV.

**SAIPAN**, *sy PAN*, is the second largest island in the Marianas group, in the western Pacific Ocean. It lies about 1,500 miles east of Luzon Island in the Philippines, and about the same distance southeast of Tokyo. Saipan covers an area of about 162 square miles. Garapan, on the western shore, is the largest town and chief trading center of the island. It has one of the best harbors in the Marianas.

Ferdinand Magellan discovered Saipan in 1521. The island belonged to Spain until 1898, when it was sold to Germany. Japan gained control of Saipan after World War I and built heavy fortifications there. The Japanese also planted many sugar-cane fields and built large sugar refineries. United States forces landed on Saipan on June 15, 1944, and captured the island after a fierce battle. Saipan then became an important American air base for further attacks which United States forces made



U.S. Navy

**Children of Saipan** once included Japanese, Okinawans, and the Chamorro natives of the Marianas. All except the native children were deported after their small Pacific island was captured by American forces in World War II.

on the islands and mainland of Japan.

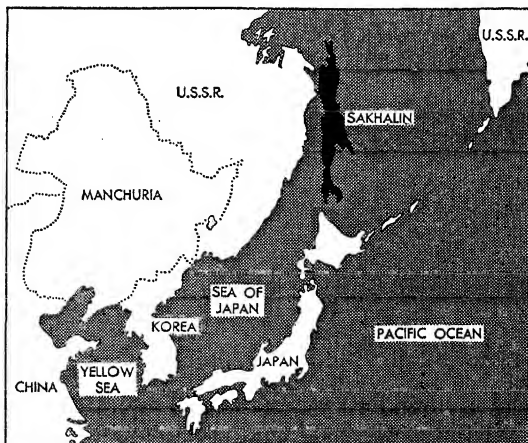
E.E.Er.

**SAKAKAWEA**. See SACAGAWEA.

**SAKE**. See ALCOHOLIC DRINK (Other Fermented Drinks); RICE (Other Uses).

**SAKHALIN**, *sah kah LEEN*, is a long and narrow island which lies off the eastern coast of Siberia. It is about 600 miles long, and from 16 to 100 miles wide. The island covers an area of 29,100 square miles.

Almost all of Sakhalin is covered with pine and cedar



Location Map of Sakhalin

...for herring. Most of the natives make a living by fishing, and fish is their most important food. Many fur-bearing animals live on the island, and some natives are fur traders. Coal mining and lumbering are carried on by convicts and exiles from the Soviet Union.

Dutch navigators were the first to discover Sakhalin. For many years Russia and Japan quarreled over the ownership of the island. In 1875 Japan recognized Russia's ownership. But disputes between the two countries continued until a settlement was reached in 1905. Russia and Japan divided Sakhalin between them after the Russo-Japanese War of 1904-1905. Russia took the northern half of the island, and Japan took over the southern half. The Japanese part of the island was named Karafuto.

The discovery of oil on Sakhalin led the Soviets to colonize the territory in 1931. Quarrels continued until the fall of Japan in World War II gave the Soviet Union complete control over Sakhalin. T.Z.

**SAKI.** See SOUTH AMERICA (animal map).

**SALADIN**, *SAL ah din* (1138-1193), was the greatest Moslem warrior of the 1200's. He brought about the Third Crusade by capturing Jerusalem in 1187. The Moslems regarded Saladin as a saintly hero, and even the Christians honored him for his honesty and bravery.

Saladin was born in the castle of Tekrit on the Tigris river in Mesopotamia. His father, a Kurd general, was governor of Damascus. The boy was brought up and educated there. Saladin later spent some time as a soldier in Syria. Afterward the caliph in Baghdad, the head of the Moslem faith, sent him to Egypt, where the Egyptian ruler also called himself caliph.

Saladin entered the service of the Egyptian caliph and through his ability as a soldier, he became the vizier, or real head of the government. When the Egyptian caliph died in 1171, Saladin seized the throne and recognized the caliph in Baghdad as the true caliph. He continued to govern Egypt as sultan and extended his rule northward over Damascus, Aleppo, Mosul, and Edessa. Saladin surrounded the Christian states along the coast and for two years fought against the Crusaders. Finally he made a truce which allowed Christian pilgrims to enter Jerusalem, and the Crusaders withdrew. See also CRUSADES. F.D.S.

**SALAMANDER.** Salamanders are usually small animals with lizardlike bodies. The giant salamander of Japan, however, is five feet long and lays eggs the size of grapes. Adult salamanders usually have four sprawling legs and long tails. They belong to the same class as the frog, toad, and newt, and are closely related to the newt. In a scientific sense, *salamander* is the name of a genus of amphibians found only in the Old World, but the term is applied loosely in America to several salamanderlike animals. Newts, too, are commonly placed in this group. Salamanders are timid creatures and usually harmless, though they may pollute drinking water.

The *spotted salamander* of America is one of the best-known species. It is about six inches long, and has conspicuous yellow spots on its smooth, dark green to brown, shiny skin. When it is roughly handled, its pores give off a milky fluid which is poisonous to some ani-

The eggs are laid in ponds or springs. They hatch in two to four weeks in early spring into creatures that breathe by external gills. The young salamanders have four limbs, but they live like fish during the larval period. When full-grown, the salamander becomes a land animal. It lives in damp places, and feeds on snails, slugs, worms, and insects. The *mud puppy* is an American salamander. See also MUD PUPPY; NEWT. E.L.P.

**Classification.** Salamanders belong to the family *Salamandridae*. The spotted salamander is *Ambystoma maculatum*.

**SALAMBRIA**, *sah lahm BREE ah*, **RIVER.** See THES-SALY.

**SALAMIS**, *SAL ah mis*, is a Greek island in the Saronic Gulf. The island is shaped like a horseshoe. It lies about ten miles west of the city of Athens. Salamis covers an area of thirty-six square miles, and has a population of about 7,757. Much of the land is rocky and mountainous. Most of the inhabitants are Albanians. They raise grapes, olives, and grain in the valleys and coastal regions. A modern name for Salamis is *Kulwi*, which means *baker's crescent*.

Ancient Greek writings tell how the Greeks and Persians struggled for the possession of Salamis in 480 B.C. When the Persians advanced after the battle of Thermopylae, the Athenians left their city and sought safety on Salamis. Persian ships tried to block the retreat of Greek vessels, and this brought about the great battle of Salamis. The Greeks sank or destroyed half of the Persian fleet, and drove the Persians out of Greece. See also ARISTIDES; THEMISTOCLES; XERXES. G.B.W.

**SAL AMMONIAC** (chemical formula,  $\text{NH}_4\text{Cl}$ ) is a white crystal compound that is made up of nitrogen, hydrogen, and chlorine. Sal ammoniac is known chemically as *ammonium chloride*. It dissolves easily in water, and gives it a sharp, salty taste. Sal ammoniac is manufactured by taking liquid ammonia that comes from gas works and combining it with hydrochloric acid. This compound is then evaporated and purified. Sal ammoniac is sometimes found as a mineral in the lava which is poured forth by volcanoes.



The Salamander, commonly believed to be when aroused, but ne

Fish and Wildlife  
Puppy, of North America is  
Salamanders  
flesh nor bite

Sal ammoniac has many important uses in industry and is also used in medicine. Its main use is in the manufacture of electric dry cells. It is also used in making the flux for soldering, in gold refining, and in the textile industry. As a medicine, sal ammoniac is often used to induce spitting up, or vomiting, for bronchitis, pneumonia, and stomach disorders. G.L.B.U.

**SALARY GRAB ACT.** See GRANT, ULYSSES SIMPSON (Grant's Second Administration).

**SALAZAR**, *sa lah ZÄHR*, **ANTONIO DE OLIVEIRA** (1889- ), became dictator of Portugal in 1928. He was born at Santa Comba Dão of peasant parents. For a time he intended to become a priest and studied at a seminary. But later he changed his mind and became a professor of economics at Coimbra University. There he built up a reputation as an expert in finance.

When the army seized control of the Portuguese government in 1926, Salazar was asked to take the post of Minister of Finance. But he refused the offer because he was not given the full powers he wished. Finally, two years later, Portugal's finances were in such poor condition that the government granted Salazar's demands. With the great powers given him as Minister of Finance, he gradually took control of the rest of the government. In 1932 he became Prime Minister, and the next year proclaimed a new constitution which gave him the powers of dictator.

As dictator, Salazar set up a typical police state on a Fascist model. Trade unions were put under government control, and freedom of the press and political expression were abolished. Salazar put Portugal's finances on a firm basis, but at the expense of public health and education projects.

During World War II, Salazar kept Portugal neutral. The Portuguese capital Lisbon became the main link between the Allied and the Axis countries. Both Allied and Axis agents were allowed to operate in the country. But Salazar maintained Portugal's traditional close ties to Great Britain, and he granted the Allies naval and air bases in the Portuguese-owned islands of the Azores. After the war, Salazar attempted to lessen his dictatorial control of Portugal. But he found the opposition strong and restored all controls. F.S.M.

See also PORTUGAL (Government).

**SALE, BILL OF.** See BILL OF SALE.

**SALEM**, Mass. (population 41,213), is one of the oldest and most historic cities in New England. Roger Williams was banished from Salem colony for preaching religious freedom. Many early colonists in Salem were hanged because they were believed to be witches. From before the Revolutionary War until the War of 1812, Salem was one of the leading seaports of the Atlantic Coast. Today, the city is no longer important for shipping, but is known for its production of cotton goods, shoes, and radio tubes.

**Location, Size, and Description.** Salem lies in northeastern Massachusetts on a narrow arm of land curving around a wide harbor in Massachusetts Bay. Salem Coast Guard Air Station is located on Winter Island in the bay. Boston lies about fifteen miles southwest. Salem covers an area of about five square miles. The narrow streets of the older part of Salem contain many historic houses. Among the most famous are the birth-

place of Nathaniel Hawthorne and the House of Seven Gables, about which he wrote his famous novel. Here also may be seen the Witch House, where the witchcraft trials were held. Gallows Hill, where some of the persons were hanged as witches, is now a beautiful park.

**History.** Roger Conant and a group of colonists from Cape Ann established the first settlement on the site of Salem in 1626. In 1628 they were joined by a group from the Massachusetts Bay Colony led by John Endicott. Both these groups believed in religious freedom, but a strong group of colonists from Boston opposed their beliefs. The Boston group later had Roger Williams banished from the colony for preaching such "dangerous doctrine."

Salem's witchcraft scare began in 1692. One of the servants of a local minister was a West Indian slave girl named Tituba. She told voodoo tales to a group of young girls of the colony, who became so excited by these stories that they shivered and screamed at night and believed they saw ghosts. A physician examined them and said they had been bewitched. Tituba and two other women were accused of being witches and were sentenced to death. The witchcraft scare continued for more than a year, and nineteen persons were hanged on Gallows Hill. Two others died in prison.

Salem was a thriving seaport by the 1700's. During the Revolutionary War, many privateers operated from the harbor. The port knew its greatest days after the war, when trade with the Orient was begun. This part of Salem history is well described in Joseph Hergeheimer's novel, *Java Head*. W.F.D.

See also WITCHCRAFT.

**SALEM**, Ore. (population 30,908). This state capital lies on the Willamette River, about fifty miles south of Portland. Large industrial plants in Salem include meat-packing establishments, fruit and vegetable canneries, and lumber, woolen, and linen mills. Salem began as a village called Chemeketa. It was named Salem in 1846, and in 1857 it received a city charter. Salem was chosen as the state capital in 1864. Salem is the home of Willamette University and the county seat of Marion County. D.E.C.

**SALEM COAST GUARD AIR STATION.** See SALEM (Mass.).

**SALEM COLLEGE** is a women's college in Winston Salem, N.C. It is controlled by the Moravian Church (Episcopal), but students of all faiths are admitted. Most of the students live in dormitories. The college was founded in 1772 and has an average enrollment of about 350. H.E.R.

**SALEM WITCHCRAFT.** See COLONIAL LIFE in AMERICA (Religion [Superstition and Witchcraft]); SALEM (Mass.); WITCHCRAFT (Salem Witchcraft).

**SALEP**, *SAL ep*, is the dried tuber of some European and East Indian species of orchids. A tuber is the thick part of an underground stem. The salep contains starch and gum. It is used in medicines as a soothing agent. It is also used in food such as tapioca. H.N.M.

**Classification.** Salep is the tuber of various species of the European genus *Orchis* and the East Indian genus *Eulophia*, both members of the *Orchidaceae*.

**SALERATUS**, *SAL eh RA tus*. See SODA.

**SALERNO.** See ITALY (Cities).



H. Armstrong Roberts

**SALESMANSHIP** is the capacity to get people to act. It is the ability to persuade other persons to support an idea willingly and happily, to buy a product, or to take a service.

Some persons used to say that salesmen are born, not made. But most persons now know that many specific methods of salesmanship not only *can* be learned, but also *must* be learned, if a person is to lead the most happy and most successful life of which he is capable.

**Everybody is a Salesman.** Salesmanship is an art, and it also approaches being a science. It is perhaps the most human of arts and sciences, because it has the most human basis of all the arts and sciences. In its broad meaning, salesmanship enters into almost every human activity. The boy who persuades his playmates that they would rather play one game than another is using salesmanship. The job-seeker must use salesmanship to convince the employer that he is worth hiring. An employer, too, often has to use salesmanship to hire a particular employee whom he wants, and then to get him to do his work in certain ways.

Salesmanship is used in almost every occupation and profession. A man who repairs automobiles in a garage seldom thinks of himself as a salesman. But the courtesy with which he does his work and the way in which he explains what needs to be done and how he proposes to do it, may determine whether or not the owner of the car will return to the garage for more service.

It is almost as important for a doctor to inspire the confidence of his patients as it is for him to have a broad knowledge of medicine. His "bedside manner" is salesmanship of a high order. A trial lawyer's job is

much like that of a salesman. He must convince a judge or jury of the truth and justice of his case. That, too, is salesmanship. A politician who is running for office must persuade the voters that he is the best man for the office. He may not be able to win the election unless he is a good salesman.

The genius of a great scientist or inventor would never be of maximum benefit to mankind without being accompanied by good salesmanship. The electric light, the washing machine, and the refrigerator might still be laboratory toys if there had not been men with the power to convince people that such new-fangled gadgets would benefit them. In a very real sense, salesmanship is education of the people to higher and better standards of living.

**Salesmanship as an Occupation.** In its narrower and more common meaning, salesmanship refers to the processes by which most goods and services are sold for use, or for resale. There are many different kinds of salesmen. There are those who sell such products as vacuum cleaners, insurance, or common household products, by approaching their customers directly in their homes or offices. Other salesmen sell products which are to be used in certain kinds of businesses or factories. These salesmen visit only those companies which are likely to use their product. Still other salesmen represent wholesale houses which sell their products for resale to stores. The stores themselves have retail clerks who make up another class of sales personnel. Still another class of persons sell their services. They include laundry operators, automobile repairmen, and dry cleaners.



### History of Salesmanship

Salesmanship has existed in a crude form since very early times. Primitive tribes traded food they raised or articles they made for the goods of other tribes. Early people bargained with each other to get as much as possible in return for their products. And in their bargaining they used many of the basic principles of salesmanship for personal persuasion.

Salesmanship took another step forward when money came into use. We know that the early Phoenician traders used money in their trade. Through the use of money they made it possible to sell goods without having to receive anything of practical value in exchange. The use of money expanded trade and in turn expanded salesmanship. But salesmanship as we know it today is a fairly recent development. Until about two hundred years ago the vast majority of all peoples bought very little goods. They made at home nearly everything they needed. They grew their own food, and they made their own clothing. They made the implements they needed for doing their work.

However, some peoples made more articles or grew more food than they actually needed, and they traded these goods for things which they were not able to make for themselves. In the towns, people began to make special kinds of goods. Cobblers made shoes, tailors made clothing, and metalsmiths made tableware and jewelry. Some of these made fairly large quantities of goods and during the Middle Ages some persons traveled from one place to another to sell or trade their surplus goods for raw materials.

But communication and transportation were so limited that selling goods at a distance was difficult. Carrying products over great distances made them too expensive for the average person to buy. So selling was only on a small scale. Yet in England during the time of Queen Elizabeth, some merchant trading organizations developed in the manufacturing towns. They collected goods and took them to coastal towns where they were exchanged for foreign goods. In turn their goods were shipped to foreign markets.

Modern salesmanship began to develop during the Industrial Revolution of the 1700's and 1800's. The Industrial Revolution introduced into selling three major elements. These were mass production, the invention of radically different products, and competition in business.

**Mass Production.** The most important thing the Industrial Revolution did was to replace hand labor with machinery. Machines produced articles more quickly and more cheaply than people could make them by hand. Soon there began to be more articles than people actually needed, and they were produced so cheaply that the common people could afford to buy them. Luxury goods came into the reach of the average person.

But people did not start buying merely because goods were available. It was necessary to educate and to persuade people to buy. Goods had to be sold rapidly if the manufacturer was to stay in business. Many manufacturers did not have time to find their own markets and sell their own goods. So there developed the sales agent for the manufacturer. These agents, or wholesalers, bought the manufactured goods and took the

risk of distributing them. They sent salesmen to the various cities to sell the goods. At first the salesmen took the goods with them. But in those days, roads were often unsafe because there were many robbers. Also it proved to be expensive to haul goods great distances, when it was not certain that they would be sold. So these "chapmen," or "bagmen," as the salesmen were called, began to take only samples of their wares with them. They showed them to prospective customers and took orders for the goods. The goods were delivered only after orders were taken. These salesmen became the first traveling salesmen as we know them today.

**Invention of New Products.** Another development of the Industrial Revolution was the invention of many new products. However, people often had to be persuaded that the new articles would be useful to them. At first many new inventions were laughed at. For example, Elias Howe patented the first practical sewing machine. But it took Isaac M. Singer to sell the public on the value of the sewing machine in the home. When the locomotive was invented, many persons were terrified by it. It took salesmanship to convince people that railroads were safe and practical.

Most people are naturally slow to try the new. They must be convinced that a new product is good and useful. The salesman acts as a teacher to explain to people how they can make their lives more comfortable by using new products. In this way salesmen have improved the world's standards of living.

**Competition.** As the Industrial Revolution progressed, there was greater and greater competition among manufacturers. Soon many different plants were making similar products. It took salesmen to convince the public that one product was better than another.

Nowadays, selling is a vital part of the economic system. Even when goods are scarce and it is comparatively easy to find customers, salesmen are needed to distribute goods, to act as the servicing and informational link between seller and buyer, and to maintain good-will relationships.

Salesmen also play a large part in creating the wealth that makes production of goods possible. This is brought about in the following manner. The salesmen get people to buy goods. The money that the salesmen bring to their companies makes it possible for those companies to improve their products and to make them in greater quantities. Greater production creates more jobs, and the workers use their wages to buy other products.

### Basic Selling Techniques

Selling is essentially a human relationship, so it is not possible or practical to confine its procedures to any rigid rules. But there are certain fairly well defined paths which successful salesmen follow and some basic techniques of salesmanship on which most salesmen are generally agreed.

**Finding the Prospect.** The income of the average salesman is based on how much he sells. His income will be low, if he spends his time in trying to sell his goods to persons who are not likely to buy. He can save time in the long run by carefully selecting and qualifying possible customers, or prospects.

The problems of finding prospects depend largely on what the salesman has to sell. For salesmen who sell essentially needed products, this problem is not great. For example, the salesman of shoemaking machinery knows that only shoe factories will buy his goods. Similarly, the salesman of a brand of expensive food would not try to sell his goods to a store whose customers had little money.

The salesman may find customers by writing letters to possible prospects before he calls with a view to developing inquiries or requests for more information from such prospects. The salesman then calls only on the people who have made inquiries. This way of getting "leads" is called "direct mail."

Salesmen of products which are in general use may rely on door-to-door canvassing. Tactful questioning of buyers may give the salesmen the names of neighbors or friends who would be good prospects.

**Preparing for the Interview.** A sales interview should be carefully planned. The salesman who goes to see a prospect with little idea of what he is going to say or do will not last long. Many sales manuals prepared by companies for their salesmen provide outlines of presentations. Other manuals give sales talks with directions as complete as the stage directions of a play. These companies require that a salesman should rehearse his interview as carefully as an actor rehearses a play. And he is asked to learn his part so well that he gives a sincere and convincing performance. Other companies prefer that their salesmen rely on no memorized presentation, but that they follow certain general patterns of persuasion which other salesmen have proved to be effective.

In any event, a salesman should enter his sales interview with a specific idea about how his product can be useful to the prospect. So it is necessary that he have as full an understanding as possible of the nature of his prospect's business.

Knowledge of the prospect's business involves also knowledge of whom the salesman should see to make his sale. Some companies have buyers or purchasing agents who make the decisions on what should be bought. Generally these decisions are influenced by certain specifications or requirements which the engineering or production departments of their companies have developed. Other companies rely on their department heads or their presidents to decide on purchases.

A salesman must be prepared to make a quick estimate of his prospect's characteristics and to adapt himself to them. Some persons like to work rapidly and come to a quick decision. Other persons' minds move more slowly. They prefer to come to a decision only after considerable discussion. The salesman should try to judge the mental inclinations of his prospect and shape his sales talk to fit such habits of thinking. Some prospects tend to be distrustful. Others tend to be emotional in their make-up. Still others are coldly logical. A few are very professional in insisting that certain "pet" ideas of their own be complied with. By engaging the prospect in preliminary discussion of other matters, the salesman often can gauge the prospect's probable manner of thinking.

**The Sales Presentation.** What is said in a sales talk

depends largely on what is to be sold. A clerk in a grocery store usually does not need to do much more than arrange the merchandise attractively and conveniently and help the shopper meet her immediate needs. But a grocery clerk can increase sales by emphasizing the reliability of certain brands of goods. He can also make helpful suggestions about the use of new products that have come on the market.

But the salesman who is trying, for instance, to get a large manufacturing corporation to use the packing cartons which his own company makes has an entirely different problem. He knows his prospect is a possible customer. He knows also that the prospect has to be convinced of the superior value of the salesman's product.

The most successful salesman is the one who can put himself in the position of the prospect, and understand his problems, his needs, and his desires.

**Motives and Emotions.** There are a number of basic human motives and deep-running emotions that are mainsprings to action. Every one, for example, seeks to acquire and to own different forms of wealth. These may be lands, goods, or money. Some people like to own farms or homes. Others like to possess automobiles, clothes, and jewelry. Still others like to make profits, accumulate money as such, or to own stocks and bonds.

The alert salesman may show that his lands or goods will produce more money, or more additional goods and lands that the prospect can get by keeping his money. He shows that what he sells will produce more for the prospect than the price asked for it. Profit is the motive for buying.

Every person likes to be well thought of by others. He strives for a good name. If the salesman can show that the "best people" are joining his association, or supporting his program, many prospects will be persuaded to follow their example.

When the salesman can show that what he proposes will make a man's heart stouter, his head quicker, or his mind faster or better informed, he employs still another motive for buying. That is why people buy books and magazines, why they join reading clubs, and why they seek education.

If a salesman can show that his article will ensure health and prolong life, he has a strong selling motive. Medicines, tonics, vitamins, sanitariums, rest retreats, and travel tours are sold on this basis.

Almost every one will act for the benefit of some one whom they love, for their family, or for their friends. Men buy homes to please their wives and children. They take out insurance to protect them. They send their children to school to educate them.

Then, too, we all do things for our community, for our country, and for the less fortunate person. Loyalty to one's country and flag, and care for our unfortunates is a strong motive to action.

We all like things of beauty, objects of art, and of personal adornment, beautiful sunsets, good music, moving drama, and delicious foods. They all create pleasurable sensations. Good salesmen show that their product has pleasing proportions, harmonious colorings and that it is good to the eyes or to the taste.

Wealth, profits, good name and fame, personal power,

## SALESMANSHIP

fine health, worth while service, and pleasurable sensations are some of many motives that inspire action.

Emotions also are highly important when it comes to getting action. Confidence and fear, pride and shame, love and hate, envy and admiration, respect and contempt, courage and caution—all these emotions play their part in moving people to act.

Effective salesmen combine appeals to motives and emotions to good advantage, at the beginning or in the middle of their presentation they show how their product, service, or idea will add wealth, health, reputation, power, or pleasure. Then toward the end of their presentation, they inspire their prospects with confidence and pride in taking the action which they propose. They show the position of honor and respect that accompanies such action. They point out how the purchaser may be the envy of others, or what joy they will afford their families. The motives and emotions, thus taken together, make for action.

Selling is not entirely a matter of talking about the product. Many a buyer has bought one product instead of another equally good product simply because the salesman of the first product showed more sincerity and eagerness to serve than did the salesman of the other product. Once the salesman is fully informed about his product and its uses, and the reputation, achievements, and capacity of his company, he will do well to add his own qualities of personal agreeableness. He should like the prospect, and seek to get the prospect to like him. Liking often grows out of common interests. The successful salesman will try to find out if his prospect likes golf, fishing, or stamp collecting. He will then try to build up a personal relationship through such interests. But he should not rely on this personal relationship alone to sell his goods.

**The Introduction and Description of the Product** itself is an important element in a sales presentation. First of all, the salesman must believe wholeheartedly in his product. He must understand how it works, how it is made, and how it can be used. He must be able to answer all questions about it without any hesitation and with complete directness.

It is not enough for the salesman to present his product and let it sell itself. He must in a sense act as the eyes of his prospect. Some buyers know exactly what they are looking for in a product, and are expert enough to judge the product without the salesman's help. But most persons must have a product explained to them, and have its good qualities pointed out. The successful salesman does this.

The salesman should develop the ability to dramatize his product. The successful actor makes himself felt by his audience as a distinct personality. The successful salesman makes his product recognized as something special. He may do this by pointing out how it is better than other similar products. Or he may describe the special research that was conducted to make the product as good as it is. He may make a demonstration of his product. Or he may use special literature to describe its qualities. The salesman must plan how to present his product in the best possible way.

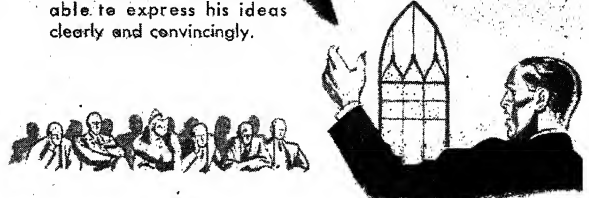
**Overcoming Sales Resistance.** One thing which the salesman must learn to handle is "sales resistance."

## THE ELEMENTS OF SALESMANSHIP

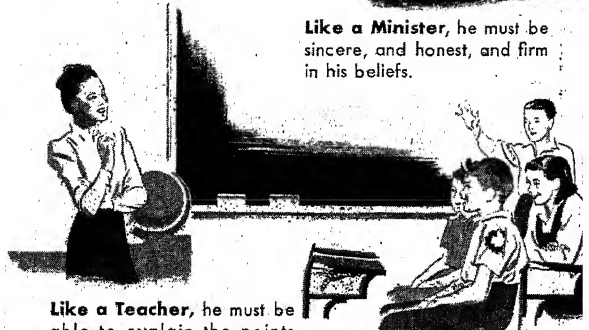
The salesman has much in common with other callings.



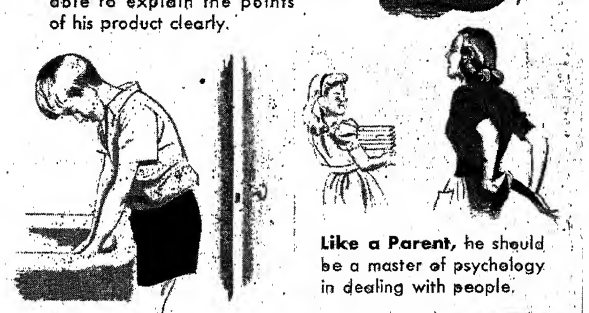
**Like a Lawyer,** he must be able to express his ideas clearly and convincingly.



**Like a Minister,** he must be sincere, and honest, and firm in his beliefs.



**Like a Teacher,** he must be able to explain the points of his product clearly.



**Like a Parent,** he should be a master of psychology in dealing with people.



**Like a Librarian,** he understands and fits his product to public taste.



**Like the Statesman,** he must both shape and follow the will of the people.

Most people are naturally cautious about spending their money, and they may make many objections to a product before they buy it. A salesman may train himself to meet many of these objections beforehand. The salesman can develop certain fairly standard answers for certain typical objections that he frequently receives. Much of this understanding comes only through experience.

A salesman should anticipate his customer's objections. He always should treat such objections with respect, even though he knows that they are not valid ones. Quite often such objections are based on fears instead of on facts. In such cases, the salesman can say, "I know how you feel. Some of our customers felt the same way at first, but here is what they have found out."

He must be trained to answer quickly any questions his customers may ask, and be ready to admit faults that are obvious, but be quick to show that the merits outweigh the faults. Failure to do so will make the prospect doubt the salesman's honesty and sincerity.

Often, objections can be turned to the salesman's advantage. Suppose the prospect says the price is too high. The salesman can then point out the valid reasons why the price of his product is higher than that of other comparable products. He can show that his product is made of better materials, has better workmanship, and will last longer. He may be able to show that his product is cheaper in the long run than other, less well-made products.

**Repeat Sales.** One of the main problems of a salesman is the assurance of repeat sales. The bases of successful repeat salesmanship are satisfactory quality, pricing, and service by the company, and complete honesty by the salesman. A buyer will continue to buy from a firm's salesman only if he has complete confidence in him, in the firm, and in its product. A salesman's honesty appears in several stages of the selling process. First, he must never make claims about his product which are not true. The buyer will soon find out that they are not true and will not buy again.

Second, a salesman should not try to sell a product to a person who does not really need it. He may succeed in making the first sale, because of his salesmanship ability. But in the long run the customer will feel that he has been led into making a bad purchase, and the salesman will lose his good will.

Third, the salesman should never make promises unless he is sure they can be fulfilled. If a customer asks for a certain service, the salesman should not promise to perform the service if he or his firm cannot perform it. Yet the salesman can do many things to build good will and to help his customers. For example, a salesman whose product is sold in retail stores can give the proprietor ideas on displays which will help sales. This, in turn, will allow the salesman to sell more of his product to the store owner.

Repeat sales depend a great deal on the personality of the salesman. "High-pressure" salesmen who exaggerate values, make strong statements without proof, and rush their prospects into action without giving them time for investigation or reflection, may be successful in first sales. But they often lose out in repeat sales because their tactics anger their customers. The most successful

salesmen in the long run are those who are straightforward in their dealings, who make their points persuasively, who prove them completely, and who earnestly seek to make their products fit their customer's own interests.

**Other Aids to Selling.** There are many modern aids to salesmanship. The wise salesman makes the fullest use of these aids. One of the greatest selling aids is advertising. Often a customer first becomes acquainted with a product through a radio or newspaper advertisement. The salesman should closely follow the advertising of his product and make full use of the selling points which it offers him. See **ADVERTISING**.

The salesman is also often equipped with literature and with picture displays which he can use effectively in his work. Sometimes he has samples of his product to show, or models by which he can demonstrate the product. Such visual aids to selling are very helpful. It has been proved that most persons can understand something they see much more easily than something they hear about. As already noted, salesmen can make much use of letters. Letterwriting is an art that takes much training and experience. See **LETTER WRITING**.

Magazines and books on products or on the art of salesmanship are also helpful to salesmen. Nearly all businesses have trade publications which describe the latest developments in their fields. The salesman should keep up to date not only on his own company's improvements, but also on those of his competitors. He should look constantly for new ideas in salesmanship.

### Qualifications of a Good Salesman

There are a few basic qualities which are helpful to almost all persons who want to sell.

**Industry and Work Organization.** A salesman does not punch a time clock. Moreover, even though he works long hours, as he should, his actual talking time to prospects is seldom more than two hours a day. This requires that the salesman be alert to find the "free time" of his prospect, and fit his calls and hours accordingly. It means also that he should so organize his day's work and his calls that he uses the least possible time in going from place to place. Where possible, appointments should be made in advance so as to cut down the time of waiting to see prospects.

**Loyalty.** The salesman must be loyal to his employer and to his company's products and policies. But he need not be a rubber stamp, blindly doing as he is ordered. He is expected to offer new ideas and critical suggestions. But once the company has made a decision as to how its business is to be conducted, the salesman should follow that decision. The success of a company as a whole depends a great deal upon the uniform way in which a program is carried out.

**Initiative and Originality.** The salesman should always be alert to the need for changes in his personal selling methods. He should be sensitive to his prospect's attitude and be ready to adapt himself to it.

**Sincerity and Enthusiasm.** No one should ever try to sell a product about which he is not enthusiastic. Prospects are quick to sense that the salesman does not believe what he is saying. A successful salesman must have complete confidence in himself and his product. This

confidence will then be carried over to the prospect.

**Courage and Foresight.** Business conditions constantly change. The salesman should have the imagination and the knowledge of his field necessary to foresee these changes. And he should have the courage to change his methods to fit new conditions. He also must have the determination to keep on presenting his product, no matter how discouraging immediate results may be. For, in the long run, and by following the law of averages, he is certain to enjoy reasonable success if he has the heart and stamina to continue to make as many presentations each day as he can crowd in.

**Leadership.** The qualities that make up a good salesman are much the same as those that make people good leaders. The boy who leads the games at a party, the girl who organizes the school clubs, the woman who does the real work in organizing public welfare campaigns — these people are likely to make good salespersons. They have the extra drive and the willingness to work which make for success.

**Understanding.** A salesman should have a thorough understanding of human nature. His job is basically a job of personal relationship. He must make people like him and respect him through his sympathetic understanding of others.

**Out-Turned Personality.** Psychologists sometimes divide people into two classes, which they call *introverts* and *extroverts*. Introverts are "turned in" on themselves. Their primary concern is their own problems. The extroverts are "turned out." They are more interested in other persons than in their own inner thoughts and worries. Most successful salesmen are extroverts. Their cheerfulness, enthusiasm, diplomacy, and open-mindedness make it easy for them to get along with people.

**Ability to Talk.** A salesman is, in a sense, a showman. Like a showman, he must be able to talk well and intelligently. If he talks hesitantly and without confidence, he annoys his prospects. They doubt the truth of what he is saying. At the same time, a salesman should be a good listener, and, at the start of his interview, a good questioner, so that he can know his prospect's situation, and so determine how his company and his product best can be of use.

**Personal Appearance.** A salesman should always be careful of his personal appearance. Some people make up their minds about a person from their first impression of him. Personal mannerisms are also important. Peculiar habits of speech often make a prospect feel uncomfortable, or even dislike the salesman. A salesman must try to see himself as others see him. He should try to analyze his own behavior and see whether he has any bad mannerisms which will tend to annoy people.

**Good Manners.** Courtesy and tact play a large part in successful salesmanship. The successful salesman is one who makes his prospect happy to buy, not just happy to get rid of him. He must be convinced that he is doing his prospect a service by trying to sell him his product. But he must never give the appearance of trying to force rather than to persuade his prospect to buy.

### Vocational Opportunities

More persons in the United States are employed in selling jobs than in any other occupation. Salesmanship

offers almost unlimited opportunities for personal advancement to energetic young men or women.

The best training for salesmanship is a broad, general education. But certain specific courses are valuable for the would-be salesman. Courses in English, psychology, logic, letter writing, bookkeeping, and other commercial subjects will help him acquire helpful skills in business and knowledge of business practices. Many high schools and colleges also give courses in merchandising and salesmanship. A training in public speaking and in dramatics may develop the salesman's ability to talk and give him more confidence. There are also special books on salesmanship which will help him.

**Selecting the Job.** A sales job should be selected as carefully as any other occupation. Working conditions vary considerably from one selling position to another. Many salesmen must travel a great deal. For persons who do not like to be away from home for long periods, such jobs would not prove satisfactory. Selling calls for hard work and long hours. People who do not have much physical strength can not perform such a job satisfactorily. Possibilities for advancement also influence the selection of a selling job.

Perhaps the most important point in selecting a selling job is the salesman's major interest in any product. Is it in how it works? Or is it in what it does? If the salesman's special interest is in how a product works, he probably will be more successful in selling to manufacturers and wholesalers. If his special interest is in what a product does, he very likely will be more successful in selling to consumers, or users. A man who knows nothing about mechanics should not try to sell tractors. But a man who has taught school successfully for several years should do well as a salesman of reference books.

**Income Possibilities.** There is perhaps a greater range in the income of salesmen than in any other occupation. Fair to good salesmen, in most fields, after required preparatory training, and if working diligently and intelligently, may make from \$3,500 to \$7,500 a year. Top salesmen's earnings are in five figures, namely from \$10,000 up. Some salesmen work on a salary basis, usually with bonuses for good sales records. Sometimes bonuses earned in a year amount to more than the annual salary. Other salesmen work entirely on a commission basis.

**Advancement Possibilities.** A salesman has an excellent chance to gain a broad knowledge of his company and the industry in which it operates. Often, salesmen with special ability rise to important positions in their firms. Salesmen may become district or general managers of the sales organizations, and from there they may be promoted to executive positions in the home office.

B.F.B.

**Related Subjects.** The reader is also referred to the sections on Vocational Opportunities in the articles: ADVERTISING; AIR CONDITIONING; AUTOMOBILE; ELECTRONICS; FOOD; INSURANCE; IRON AND STEEL; JEWELRY; PETROLEUM; PLASTICS; PUBLISHING; RADIO; REAL ESTATE; RUBBER; TELEVISION.

### Questions

What is salesmanship? Explain.

How may an employer, a doctor, or a lawyer have to use salesmanship?



How did the first use of money affect salesmanship?  
Who were perhaps the first modern traveling salesmen?

What is "sales resistance"? How does the salesman try to overcome it?

What training is especially desirable for a salesman?

What is perhaps the most important point in selecting a selling job?

**SALES TAX.** A sales tax is a tax which may be placed on any kind of goods so long as it is collected at the time of sale. It is sometimes placed on sales of real estate, securities, or services. The sales tax may be used by a city, a state, or the Federal Government, and can be collected when a sale is made at retail, at wholesale, or by the producer or manufacturer. The rate of taxation is usually low, although a high rate may be levied on luxury goods, such as jewelry and furs, or on such taxable items as gasoline.

The main objection to most sales taxes is that they fall heavily on persons who receive low incomes. Persons with low incomes must spend a large share of their wages on consumers' goods. So they pay more sales tax in relation to their incomes than wealthy people do. The main advantage to the sales tax is that it produces a great deal of money. This accounts for its widespread use. R.D.P.

**SALFORD** (estimated population, 201,800) is an English manufacturing city. It lies a few miles west of Manchester and has large cotton, iron, and chemical factories. The Manchester Ship Canal runs through the city.

**SALIAN**, *SAL ih an*. See FRANK; SALIC LAW.

**SALICIN**, *SAL ih sin*, is a drug which comes from the bark of willow trees. It is used to relieve pain.

**SALIC LAW.** Historians believe that Clovis (466?-511), King of the Salian Franks, had the Salic laws drawn up during his reign. The Salic Law, although it was written in Latin, was founded upon Germanic, and not Roman, custom and procedure. Sections of the Salic Law listed fines to be paid to the relatives of free persons who were killed, injured, or insulted.

In the 1300's the Salic Law played an important part in the history of France. The last son of Philip IV died without leaving any direct male heirs. French lawyers used the Salic Law to keep Edward III of England from gaining the throne of France. Edward was the son of a daughter of Philip IV, and the French argued that a kingdom could not be inherited through a woman. Actually, the Salic Law had said nothing about the inheritance of kingdoms. It simply stated that Salic land could not be inherited by women.

The French finally recognized Philip VI, the son of a brother of Philip IV, as king of France. As a result, Salic Law came to mean that royal authority could not be inherited by a woman or through the descendants of a woman. W.F.McD.

**SALICYLIC**, *SAL ih SIL ik*, **ACID** (chemical formula,  $C_6H_4(OH)(COOH)$ ) is the foundation of one of our most popular home remedies, aspirin, or acetylsalicylic acid. The pain-relieving qualities of this compound, together with its comparative harmlessness, makes it a drug well-regarded in every land. Another salicylic-acid derivative is oil of wintergreen, or methyl salicylate. This oil is a popular flavoring material for candies, chewing gum, and soft drinks.

Salicylic acid occurs as colorless needle-shaped crys-

tal of a sweetish acid taste. It dissolves a little in cold water, but dissolves readily in hot water, ether, or alcohol. It may be extracted from oil of wintergreen, but more often it is made artificially from sodium phenate and carbon dioxide.

Salicylic acid is a powerful poison for the bacteria that cause food to spoil, and formerly was used as a food preservative. Salicylic acid is used in treating ringworm and eczema, and in the manufacture of dyes. The khaki color of United States army uniforms comes from a salicylic-acid dye. G.L.Br.

**SALIERI**, *sah LYEH ree*, **ANTONIO** (1750-1825), was an Italian composer and conductor. He composed about forty operas, but he is probably best known as the teacher of Ludwig van Beethoven, Franz Schubert, and Franz Liszt. He was a rival of Wolfgang Mozart, but did not poison him as Nikolai Rimski-Korsakov had him do in his opera *Mozart and Salieri*.

Salieri was born at Legnano, Italy, and studied the violin and organ as a child. At fifteen, he went to Venice to study harmony and singing. F. L. Gassmann, conductor at the Austrian emperor's court, took Salieri to Vienna in 1766. Four years later, the young composer conducted his first opera, *Le donne letterate*, at the court. He wrote nine more operas in quick succession. In 1774 Gassmann died, and Salieri took his position as Chamber Composer and Conductor of Opera. From 1788 to 1824 he was Court Conductor in Vienna. G.B.

His Works include several oratorios and cantatas, many sacred works, a symphony, and a number of concertos.

**SALINA**, Kan. (population 21,073), lies in the hard winter-wheat belt of the Middle West and ranks fourth among the cities of the United States in the production of flour. Salina mills produce an average total of about 10,000 barrels of flour a day. The city is the chief business center of north-central Kansas. It lies on the Smoky Hill River, about 190 miles west of Kansas City. Other important products of Salina are farm implements, flour-mill machinery, playground equipment, and foodstuffs. Salina is the home of Kansas Wesleyan University, St. John's Military School, and Marymount College. It is the county seat of Saline County. K.Me.

**SALINOMETER**, *SAL ih NOM ee tur*. See HYDROMETER.

**SALISBURY**, *SAWLZ behr ih*. See ENGLAND (Cities).

**SALISBURY**, Md. (population 13,313), is the largest town on the Eastern Shore of Maryland. It ranks second only to Baltimore among the ports of the state. Salisbury is situated near the geographical center of the Delaware-Maryland-Virginia peninsula.

Salisbury manufactures include canned goods, building materials, paper boxes, creosoted products, brass, iron, shirts, flour, and ships. It is also a distributing point for fresh fruits and vegetables. Salisbury was founded in 1732. It became the county seat of Wicomico County in 1867. D.M.D.

**SALISBURY** (population 51,761), is the capital of the British African colony of Southern Rhodesia. The city stands on a plain near the Hunyani River, at an altitude of 4,865 feet above sea level. It is in a healthful area devoted to corn growing, mixed farming, and dairying. Salisbury, with a European population of over 18,000, is a modern city of wide, tree-bordered roads and many public gardens. Cecil Square, in the center of the city,

## SALISBURY, ROBERT ARTHUR

was named after Sir Cecil Rhodes, the founder of Rhodesia.

H.V.B.K., Jr.

**SALISBURY, ROBERT ARTHUR TALBOT GASCOYNE-CECIL, MARQUIS OF** (1830-1903), was a distinguished English statesman.

Salisbury was born at Hatfield in Hertfordshire and was educated at Christ Church, Oxford University. In 1853 he was elected to Parliament. His father died in 1868. Cecil then became the third Marquis of Salisbury, and took his seat in the House of Lords.

In 1874 Benjamin Disraeli became Prime Minister and Salisbury entered his cabinet as Secretary of State for India. In 1878 he was made Secretary of State for Foreign Affairs. Disraeli died in 1881 and Salisbury became leader of the Conservative party. In 1885 Salisbury became Prime Minister. But a general election was soon called and the Conservatives were again defeated. William E. Gladstone followed Salisbury as Prime Minister, but was himself defeated in 1886. Salisbury then returned to the premiership until 1892. From 1895 until 1902 he was again Prime Minister.

A.M.

**SALISBURY CATHEDRAL.** See ENGLAND (The Arts).

**SALISH, SA lish, INDIAN.** See INDIAN, AMERICAN (Table of Tribes).

**SALIVA, sah LI vah,** is a sticky fluid produced in the mouth. Saliva is very important to the digestion of food. It is colorless and has a watery appearance. It contains some mucus and is alkaline in its chemical action. By alkaline we mean that saliva will neutralize acids. Saliva contains certain substances called *enzymes* that cause chemical changes in foods. The most important enzyme in saliva is *ptyalin*. Ptyalin changes starches into simpler substances called *maltose*.

Saliva moistens and softens all food that is taken into the mouth. It helps in the chewing and swallowing of food. It also keeps the mouth moist, which is important to comfort. The most important action of saliva is on starchy foods. All starches are broken down by saliva into maltose, which is the first step in digestion.

Saliva is produced by three pairs of glands in the mouth and cheeks, known as *salivary glands*. One pair of glands is located in front of the ear and is known as the *parotid*. Another pair is located under the lower jaw and is known as the *submaxillary*. The third pair of glands is located under the tongue and is known as the *sublingual*. There are several other small glands in the mucous membrane of the mouth that also aid in producing saliva. See also MASTICATION.

A.C.I.

**SALIVARY, SAL ih VAIR ih, GLAND.** See SALIVA.

**SALLUST, SAL ust** (86-34 B.C.), was a noted Roman historian and politician. He was the first Roman to treat history as more than just a chronicle of events. Sallust's writings contain the reasons for each event and character studies of the people involved. Sallust was born of a poor family, in Amiternum in central Italy. He served as quaestor in about 59 B.C. and about eight years later was made tribune of the people. Sallust was a friend of Julius Caesar who named him proconsul, or governor, of Numidia. He made a fortune there by dishonest practices. He then returned to Rome and devoted himself entirely to writing. See also JUGURTHA.

J.W.Sw.

**His Works** include *The Conspiracy of Catiline* and *The Jugurthine War*.



**SALMON, SAM un,** is one fish that nearly everybody knows at least by taste. Millions of cans of its firm, pink or red flesh are sold every year. Salmon, ready-cooked so that it can be eaten directly out of the can, has had tremendous importance in enlarging the diet of soldiers, prospectors, explorers, and peoples in the far-flung corners of the earth. The salmon is one of the chief food fishes of the world.

Yet man's interest in the salmon is not caused entirely by its economic value. The salmon has a fascinating life story. It spends its adult life in the sea. Then, when the time comes for the salmon to lay its eggs and die, it is driven by some mysterious urge to battle rushing currents and leap headlong up swift waterfalls to reach the quiet inland streams where it shapes its underwater nests and lays its eggs.

In spite of the vast amount of study that has been made of the salmon's habits, there is still a great deal to learn about the life of the various kinds of salmon.

In the United States, when we speak of salmon, we usually mean any one of the five different members of the salmon family that live in the rivers and coastal waters of the North Pacific Ocean. These are found from California up the coast to Alaska and across to Siberia. One kind lives in the North Atlantic. But the *Salmonidae*, or salmon family, includes quite a large number of other fishes that we know better by other names. Some of these other fishes are the trout, the grayling, and various white-fishes. All of them are found in the North Temperate Zone all around the world. The fishes we know as "salmon" are found nowhere except on the American and Asiatic sides of the North Pacific, and in North Atlantic coastal waters.

The five kinds of Pacific salmon belong to the genus *Oncorhynchus*, a word that means *hooked snout*. It is interesting to know how and where the Pacific salmon got their curious, Russian-sounding scientific names. The species names of the genus *Oncorhynchus* are exception-

ally odd to American ears — *tschawwyscha*, *gorbuscha*, *kisutch*, *keta*, and *nerka*. These names were taken directly from Russian words. Some 200 years ago, long before the American Northwest was settled, these fishes were well known to the Russians in Siberia and Alaska. They had been catching and eating salmon for generations, and had given them vernacular, or common, names. The scientists came along and simply adapted the Russian common names to fit their scientific purposes.

The kind of salmon that is generally set apart from the Pacific forms by being called the "Atlantic salmon" is found along the North Atlantic coast of America and Europe. It is a member of the salmon family, but is somewhat different from the Pacific kinds in its appearance and habits.

One extraordinary thing about the Atlantic salmon is that it is often found to be landlocked in the lakes of Maine, New Hampshire, Vermont, and northward into Canada. This means that the fishes are in lakes that have no outlet by which the salmon could reach the sea. Thus, these salmon are compelled to spend their lives in fresh water without making the migrations to salt water that the Pacific salmon make.

These Atlantic salmon (*Salmo salar*) are not so common in the waters of the United States as they used to be in colonial times, but they are still among the world's finest game fishes. Salmon fishermen praise the sport extravagantly. Fifteen or twenty pounds is a good average weight for an Atlantic salmon, although eighty-pound salmon have been taken.

#### Life History

The Chinook salmon is more or less typical of the whole salmon group. It comes close to being what an artist might call "the way a fish ought to look." It has grace and strength and color in magnificent proportions. Its great silvery body glistens and shimmers. It is black-spotted on the back and dorsal and tail fins. The sides of the head are a glistening metallic color. Its body is firm and rounded and its tail is powerful. This is a description of the Chinook in the bloom of its health and

maturity before it has spawned. A sad change and decay comes over the fish after it has laid its eggs. Death approaches after its terrific struggle to reach its nesting place which may be hundred of miles from the sea.

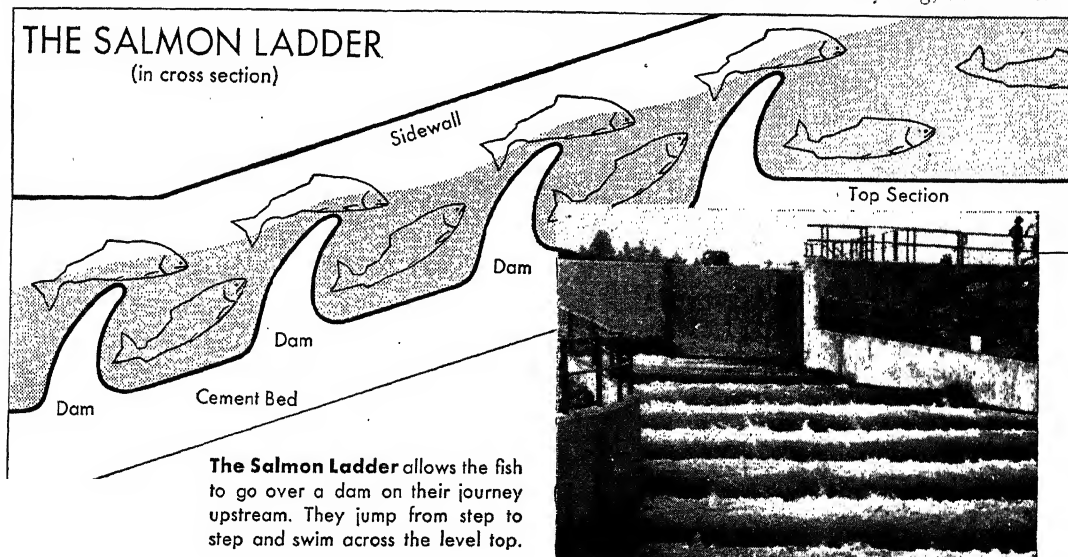
If one would follow a typical salmon from hatching until the time came for it to produce the next generation and die, the story would start on an autumn day far up the fresh-water streams that wind down the slopes to the sea in the Pacific Northwest. Salmon prefer to deposit their eggs in fairly shallow water, at a depth of a few feet. Usually they lay their eggs at the head of a riffle where the fast-running water will seep into the gravelly bed of the streams and bring a plentiful supply of life-giving oxygen to the developing eggs.

In this ideal spot the female salmon clears away a nest, or *redd*, among the loose stones by vigorous swishes of her tail and body that scatter the mud and tiny plants that cling to the stones. When the redd — which may be from five to six feet across — is clean and "dustless," the female is ready to lay her eggs. Enormous numbers of eggs are dropped among the stones. One female may deposit 10,000 of the pinkish globules about the size of a pea. Over them the male salmon gives off a milky substance called *milt*, and development of the fertilized eggs starts immediately.

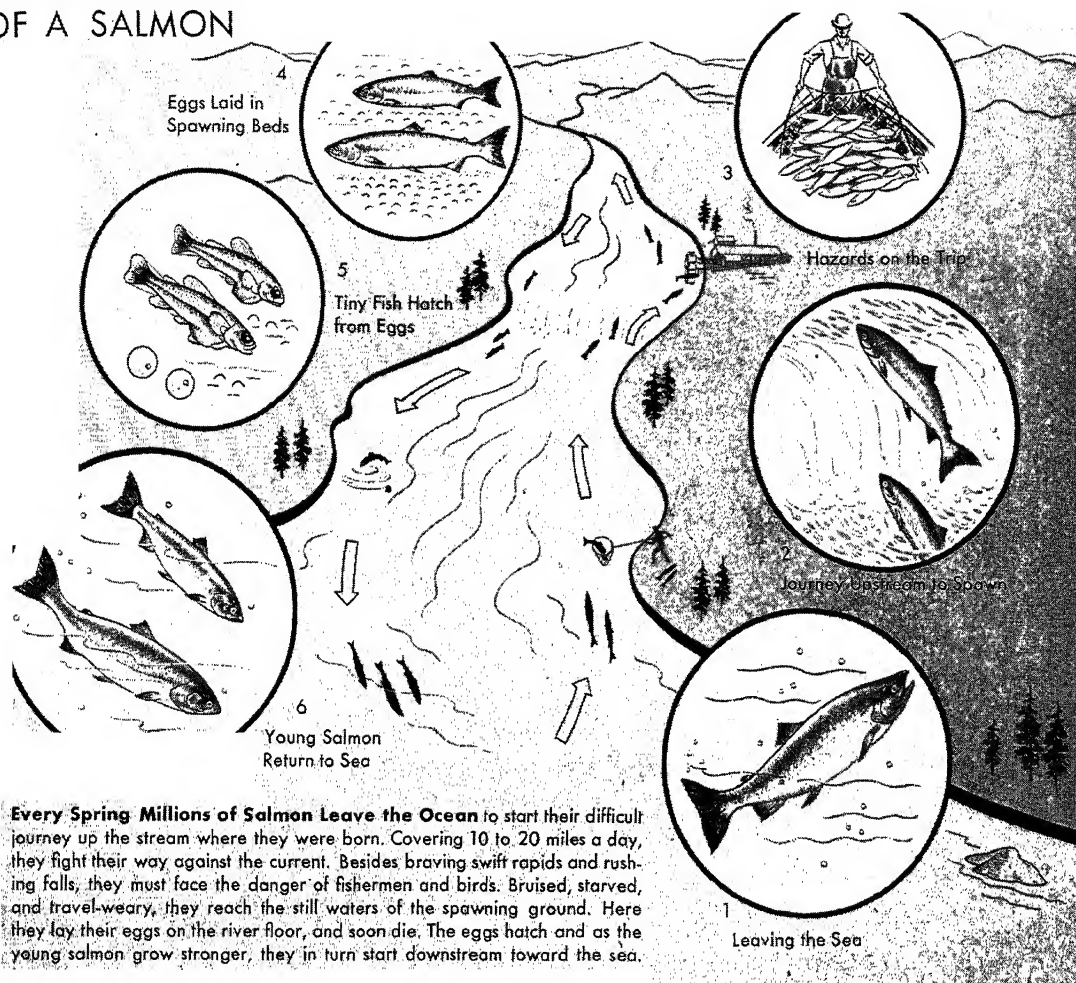
Life is over for the parents after the eggs have been deposited and fertilized. The approach of spawning brings a change in adult salmon. Their silver scales change to dull, leaden colors. The skin grows very slimy. The males, especially, develop queer lumps and humps. Their fins are likely to be torn and ragged from their exertions in reaching the spawning grounds. They look as unappetizing as they actually are. Their flesh is pale and tasteless and useless for human food.

Life is nearing its end, but as long as the salmon can struggle they persevere in facing the current of the stream. Slowly they float tail foremost downstream. In a few days they are dead and washed ashore or fished out by some hungry bear or raccoon.

Meantime, life has been stirring among the eggs. In about two and a half months the young, called *alevins*,



# THE LIFE STORY OF A SALMON



**Every Spring Millions of Salmon Leave the Ocean** to start their difficult journey up the stream where they were born. Covering 10 to 20 miles a day, they fight their way against the current. Besides braving swift rapids and rushing falls, they must face the danger of fishermen and birds. Bruised, starved, and travel-weary, they reach the still waters of the spawning ground. Here they lay their eggs on the river floor, and soon die. The eggs hatch and as the young salmon grow stronger, they in turn start downstream toward the sea.

burst forth. Carrying a huge yolk sac which nourishes them in the early weeks, they lie hidden from larger fish, ducks, herons, and many other enemies that they will meet in later life. They rest for another two and a half months until they begin to take on the familiar shape of little fishes and are ready to venture forth as free-swimming fry.

In about a year the fish get the urge to leave the familiar waters where they were hatched. The little salmon may be about five inches long by this time. It is a vigorous, lively creature already old enough and big enough to prey on fishes smaller than itself.

Head into the current as healthy fishes always swim, the salmon starts downstream. It runs the gauntlet of enemies that lie in wait in the water, in the air, and on the riverbanks. Bear, mink, raccoons, ducks and herons, and polluted areas of the river where city and factory wastes have fouled the water, inevitably take their toll of the salmon. Only a very small proportion of the salmon that are hatched actually reach the sea five or six months after they start to the sea.

But in the sea a new life awaits them. Food is likely to be plentiful — vast acreages of "pink feed," a kind of

tiny shrimp, are there to eat. They have only to swim among it, mouth open, to engulf enormous quantities.

Scientists have never found exactly how far the young salmon swim out beyond the mouth of the rivers in which they were spawned. Some of them travel only a few miles out to sea and up and down the coast. Others may swim for hundreds of miles. One and all, they spend the next three or four years feeding greedily on the smaller creatures of the sea, and even on fishes of considerable size and strength. A salmon's one purpose at this stage of its life is to eat so it can grow. Almost anything that it can get into its mouth is likely to be seized and swallowed.

But the day comes when something causes the adult salmon to turn back toward the fresh water in which its life began. This has been called a "homing instinct" by some investigators. They believe that many salmon return to the same river and even to the same part of the river in which they were spawned. Other investigators believe that when the salmon turn back toward the coasts they enter any fresh-water stream pouring into the sea. But there seems to be definite evidence that at least some salmon have wandered far afield in the ocean, and

have cut across the mouths of other rivers on their return to enter the very same river from which they started out. They were surely moved by something very like a homing instinct.

Like their parents before them, they go "home" to spawn—and to die. The journey may take several months. It is during these "runs" of the fish toward their spawning grounds that vast numbers of salmon are caught in nets and traps for the canning industry. But enough get through to spawn and start the cycle all over again.

During the "runs" of the salmon to the upper reaches of the rivers they perform their amazing feats of leaping through rapids and up waterfalls a dozen feet high. The strength and persistence of these fishes is legendary.

In recent years the damming of many streams in the Pacific Northwest for land cultivation and electric power projects has seriously affected the salmon runs. In some cases "fish ladders"—artificial, sloping waterfalls—have been made for them. Many salmon are caught before they reach their spawning grounds. Their eggs are pressed out and fertilized by hand. The young fishes are reared in hatcheries and then set free.

#### Kinds of Commercial Salmon

**Chinook Salmon**, also called *king*, *quinnat*, or *spring* salmon. Scientific name, *Oncorhynchus tshawytscha*. It is a spring-run species with reddish, oily flesh. It is known

to the canning trade as the Columbia River salmon. The Chinook ranges from California to Bering Strait, Alaska. The average weight is about twenty-two pounds, although it sometimes reaches as much as a hundred pounds.

**Sockeye Salmon**, also known as *red* or *blueback* salmon. Scientific name, *O. nerka*. This is another fine-flavored spring-run fish. It is comparatively small, usually five to eight pounds. The flesh is deep red, and the skin turns a strong red in the breeding season. Millions of pounds of this fish are canned in Alaska.

**Silver Salmon**, or *coho*. Scientific name, *O. kisutch*. This is a fall-run species of great commercial importance. It is small, about eight pounds in weight, with pink flesh. It ranges northward from San Francisco and is especially plentiful in Puget Sound.

**Pink Salmon**, or *humpbacked* salmon. Scientific name, *O. gorbuscha*. This is a small salmon, three to six pounds in weight. It is a fall-run species abundant in Alaskan waters.

**Dog Salmon**, also called *chum*, *keta*, or *calico* salmon. Scientific name, *O. keta*. This salmon is not so important commercially as the others, because its flesh is not good for eating. It is a fall-run species and weighs about twelve pounds on the average. It ranges from the Sacramento River to Bering Strait.

W.B.R.

See also FISH (text and color plate, Salt-Water Fish [King Salmon]); FISHERY; TROUT; WHITEFISH.



**Brailing Salmon from a Pile Trap** in the icy waters off the coast of Alaska. The salmon trap is a net supported by wooden pilings, placed in the path of a salmon run. After the

fish are trapped, a brail is used to dip them out of the pile trap. The brail is a strong strip of net, weighted with chains, which is raised and lowered by a power boom.

U.S. Forest Service



# HOW SALMON IS CANNED

Salmon are carried from the ship's hold by means of water flowing down a runway. A moving belt carries them up into the cannery.

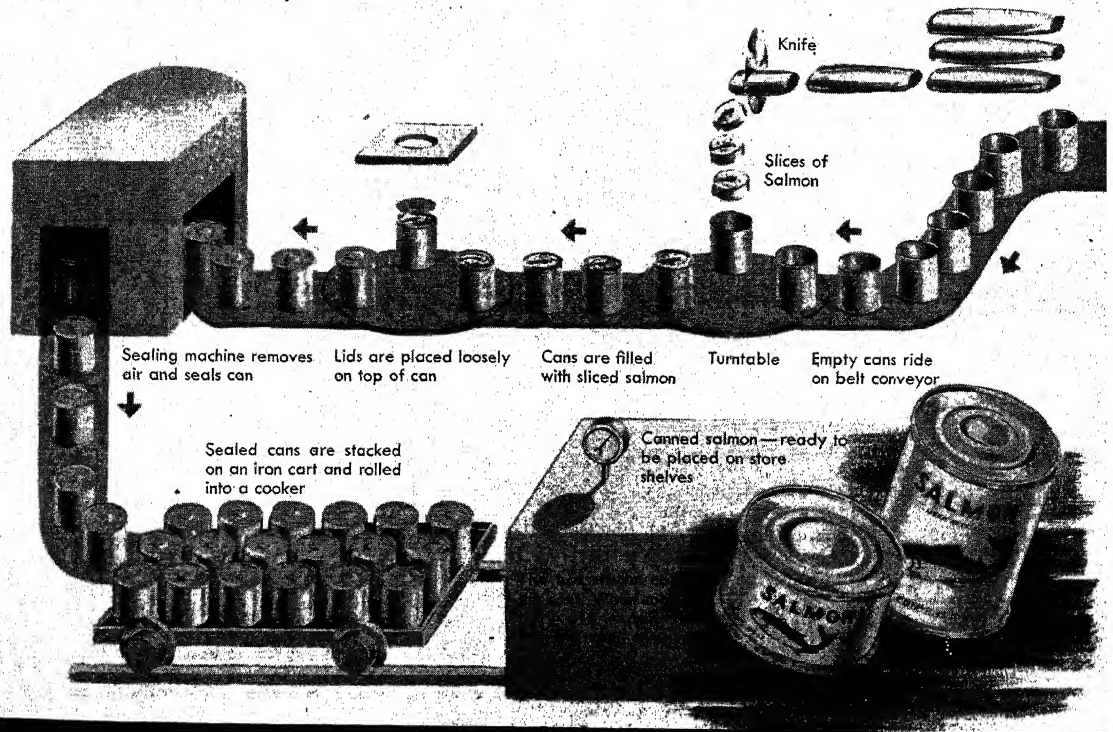
The fish are dropped into a large bin.

Another machine scrapes off scales.

Cutting and cleaning machine

The internal organs are removed. The fish are washed.

The cleaned fish are cut into sections and dropped into cans. The cans move on a series of belts and turntables which allow them to pause just long enough for each operation.



## Outline

- I. North American Salmon
- II. Life History
- III. Kinds of Commercial Salmon

- |                   |                |
|-------------------|----------------|
| A. Chinook Salmon | D. Pink Salmon |
| B. Sockeye Salmon | E. Dog Salmon  |
| C. Silver Salmon  |                |

## Questions

- How has salmon been important as a food fish?
- What do people in the United States usually mean by *salmon*? What are some of the many well-known fishes that belong to the salmon family?
- Where do salmon usually lay their eggs? Why?
- What is a *redd*, and how is it made?
- How many eggs may a female salmon lay? How are they fertilized?
- How does the salmon's appearance change after spawning?
- What are some of the enemies of young salmon?

**SALMON**, Ida. (population 2,439), is the north-central gateway to Idaho. It lies at the meeting point of the Salmon and Lemhi rivers. The city is a supply center for a large mining and grazing region. Lewis and Clark passed the site of the city in 1805. The Mormons established a mission here in 1855 but were forced to leave two years later. Salmon was laid out in 1867. The city is the seat of government of Lemhi County. H.L.T.A.

**SALMONELLA**, *SAL* *moh NEL* *ah*, **POISONING**. See BACTERIA (Harmful Bacteria).

**SALMON RIVER**. See IDAHO (Rivers, Springs, Lakes, and Waterfalls).

**SALMON RIVER MOUNTAINS**. See IDAHO (Physical Features).

**SALMON TROUT**. See TROUT.

**SALOL**, *SAL* *ohl*, a white crystalline powder composed of salicylic acid and phenol. Salol is employed in medicine as an antiseptic.

**SALOME**, *sah LO mee*, is the Biblical character who is said to have caused the beheading of John the Baptist. She was the daughter of Herodias and the stepdaughter of Herod Antipas, governor of Galilee and Peraea.

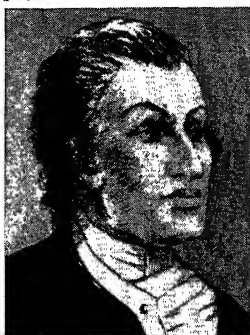
According to the Biblical story, Salome danced at a birthday party for Herod. He was so pleased that he offered to grant Salome any request she might make. Salome requested the head of John the Baptist. Herod ordered John beheaded and sent the head to Salome on a platter.

Another Salome appears in the Bible as one of the holy women present at the crucifixion and later at the resurrection of Christ. She was the wife of Zebedee and the mother of the apostles James and John. F.C.G.

See also HEROD (Antipas); JOHN THE BAPTIST; OPERA (Some of the Famous Operas [Salome]).

**SALOMON**, *SAL* *oh mun*, **HAYM** (1740?-1785), was an American banker and patriot. He was born into a Jewish family of Lissa, Poland. In 1770 he was forced to flee the country because of the active part he took in the struggle for Polish independence. In 1772 he came to New York City, where he became a money broker and commission merchant. He became active in the movement for American independence, and the British arrested him as a spy after the outbreak of the Revolutionary War. But in 1778 the British freed him, and he went to Philadelphia to work for the Revolutionary cause.

There Salomon organized a brokerage firm. He became paymaster general to the French forces in America and



Brown Bros.

**Haym Salomon**, Jewish patriot of the American Revolution

handled most of the French and Dutch war loans. In addition, the American government borrowed more than \$600,000 from him, and he advanced other money to pay the salaries of government officials, army officers, and foreign agents, and to help outfit the troops. After the war, Salomon had business difficulties, and died suddenly, a bankrupt. His heirs tried to get the government to pay the money it owed him, but were unsuccessful. T.R.H.

**SALON**, *sah LAWN*, is a French word for an impressive hall used for receptions and exhibitions. Since the time of the early art exhibits in the Louvre, the word has been used for periodical art exhibitions. Up to World War II, two chief official salons were held each spring in Paris. That of the Société des Artistes Français can be traced back to 1673. The Salon of the Société Nationale des Beaux Arts was founded in 1889 in protest against the conservatism of the older body. Other important salons are the Salon des Indépendants, the Salon d'Automne, and the Salon of the Société des Artistes Decorateurs. The last shows the applied arts, jewelry, furniture, and pottery.

*Salon* is a word also used for a gathering of people famous in the arts or for their wit. T.F.H.

**SALONIKA**. See GREECE (Cities).

**SALPIGLOSSIS**, *SAL* *pih*, **GLAHS** *is*. See PAINTED-TONGUE.

**SALSIFY**, *SAL* *sih fih*, or **OYSTER PLANT**, is a biennial garden vegetable with a fleshy root which has an oyster-like flavor. The plant is native to Mediterranean countries, but grows well in the soil and climate of the northern United States. The tapering roots are used in Europe and America as a table vegetable. A common method of preparation consists in cutting them into small pieces, boiling until tender, and creaming. They are also very good boiled, then dipped in cracker crumbs and fried. They give an agreeable flavor to soups. Salsify is cultivated in the same manner as the parsnip, and the roots are easily kept over winter, either in the ground or stored in cool, moist earth. See also PARSNIP. L.A.So.

**Classification**. The oyster plant belongs to the composite family, *Compositae*. Its botanical name is *Tragopogon porrifolius*.

**SAL SODA**. See SODA.

**SALT** (chemical symbol, NaCl) plays such an important part in the function of the body that it is probable that this mineral has been used ever since warm-blooded animals began to live on the earth.

The first written reference to salt occurs in the Bible. In the Book of Job which was written about 300 years before the birth of Christ, there is the line, "Can an unsavory thing be eaten, that is not seasoned with salt?" (Job 6:6).

Salt at one time had religious significance, and was a symbol of purity. Among the Hebrews, it was a religious custom to rub newborn babies with salt to insure their good health. A Hebrew man could divorce his wife if she neglected to salt his food. The "covenant of salt" mentioned in the Old Testament was one which could not be broken. Christ spoke of His disciples as "the salt of the earth," referring to their spiritual influence on the world.

Among the Orientals of the present day, as in the past, salt used at a meal is a sign of friendship and hospitality. The Arabs say "there is salt between us," meaning friendship; "to eat of a man's salt," meaning to be his guest; "to sit above the salt," meaning to sit in the place of distinction. In Iran, a man who is said to be "untrue to salt" is accused of disloyalty. Roman historians mention that German tribes fought for the possession of salt springs because they believed such regions were sacred.

Salt was the chief economic product of the ancient world. It was important in the development of the earliest highways of trade. The salt of Palmyra and Tadmor built up the vast trade routes between Syrian ports and the Persian Gulf. The great salt mines of northern India were the center of a wide trade before the time of Alexander the Great.

The Via Salaria, or Salt Road, one of the greatest military roads in history, was built from the saltworks at Ostia to Rome by Roman soldiers.

Salt was once so scarce and precious that it was used as money. Caesar's soldiers received part of their pay in

common salt. This part of their pay was known as their *salarium*, and it is from this word that the word *salary* comes. Even today, salt is the chief medium of exchange among the natives of some of the South Sea Islands.

The North American Indians called salt the "Magic White Sand." Many wars were fought between tribes over the ownership of salt springs in inland regions where salt was scarce.

**What Salt Is.** Salt contains two elements, chlorine and sodium. It is known chemically as *sodium chloride*. Mineralogists refer to the salt found in mines as *halite*. Common salt is the salt found in the oceans, salt lakes, salt springs, and salt mines.

#### Sources of Salt

**Salt from the Sea.** There is a little over a quarter of a pound of salt in each gallon of sea water. It has been figured that if all the oceans dried up, they would leave about 4,419,300 cubic miles of rock salt, which is about fourteen and a half times the bulk of the entire continent of Europe, including the mountains. The waters of the Mediterranean and Caribbean contain the greatest amounts of salt among the larger seas. The smaller, enclosed seas, such as the Dead Sea, the Black Sea, the Red Sea, the Caspian Sea, and the Great Salt Lake contain even larger amounts. Salt was first taken from the sea by scooping shallow holes for basins along the seashore. The breaking waves threw the salt water, or brine, into the basins. The brine was dried up by the sun and it left deposits of crude salt on the sand. This process was known as the sun, or solar, method. Although the solar method is still used, much of the brine is dried out by cooking it in huge kettles. Today, salt of high purity is taken from the sea.

**Salt from the Mine.** Salt is found in mines beneath the ground in almost every part of the world. If the salt vein is near the surface or even above it, the salt is easily removed. Salt licks, or rocks of salt which appear above the ground, are the means of supplying animals with the salt their bodies need. Most salt mines lie far beneath the surface, and the salt is mined in a way similar to coal. Elevator shafts are sunk far below the ground. The miners descend and chip out holes from the solid rocks of salt so that dynamite may be inserted. The dynamite blasts huge chunks of the salt, which are picked up and carried away, usually by railway cars, to be refined and packaged.

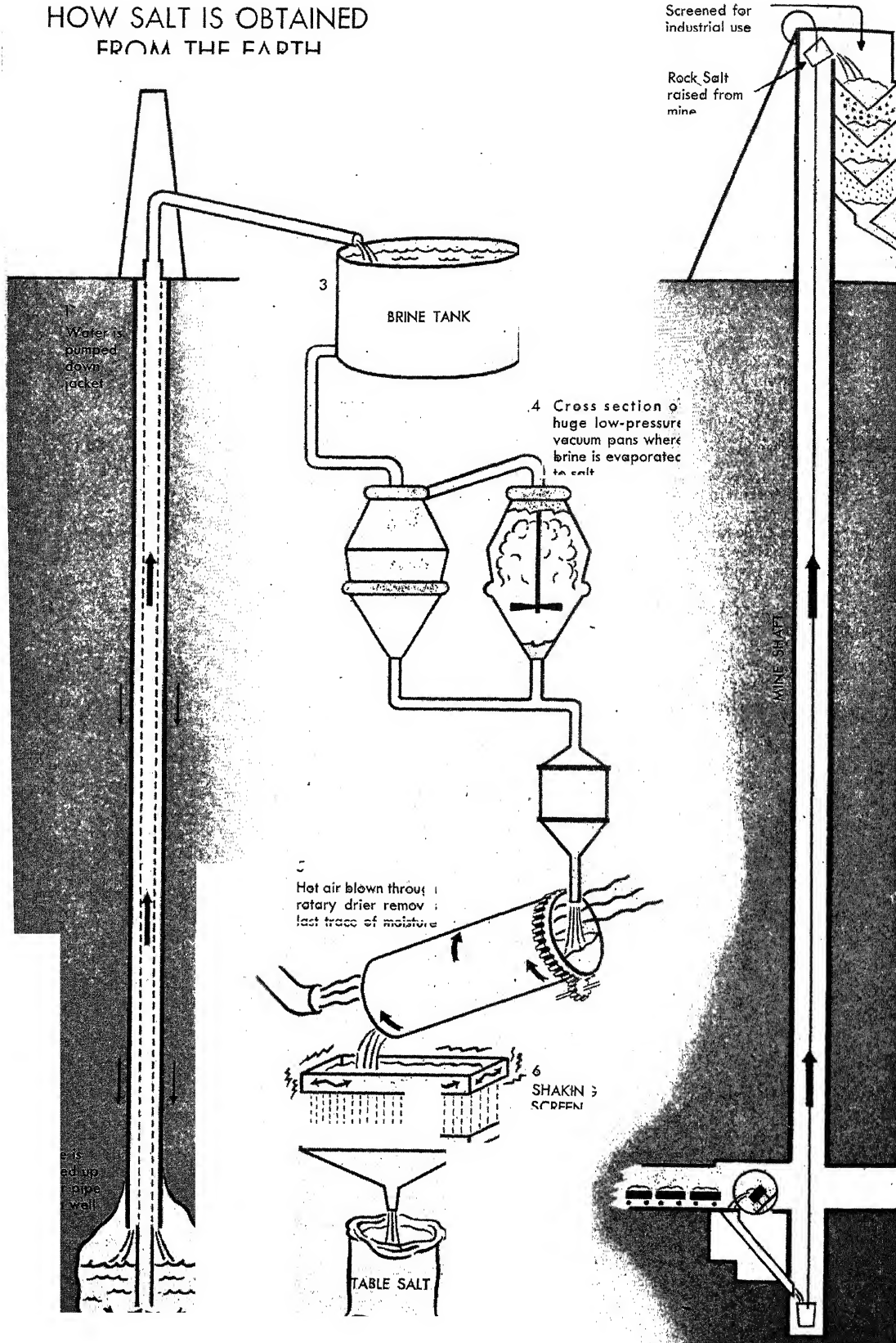
**Salt from the Well.** The greatest part of the salt produced in the United States comes from salt wells. The salt well produces salt by means of water power. A well is drilled down to the rock salt deposit in the way that water, gas, or oils are drilled. The salt well differs from other wells because it has a double pipe, or casing, sunk into it. One pipe is inside the other. Pure, fresh water is pumped down the outer pipe to the salt vein below. It forms a brine, or mixture, of salt and water, which is heavier than water, and sinks to the bottom of the well. The mixture is then forced up the inner pipe by the pressure of the fresh water which keeps coming down. When a vein of rock salt is very deep, air pressure is used to force the brine to the surface. The brine which rises from salt wells contains only the impurities which dissolve in water. The solid, impure matter is left at the



J. Horace McFarland

**The Salsify Is Also Called the Oyster Plant** because it acquires a decided oyster flavor after a heavy frost. It is a healthful and delicious vegetable, having a richness of flavor that surpasses both carrots and parsnips.

HOW SALT IS OBTAINED  
FROM THE EARTH



bottom of the well. The brine is then refined in tanks in about the same manner as sea salt.

### Salt Production

The United States, including Puerto Rico, produces about 13,500,000 tons of salt each year. About 3,500,000 tons of salt produced each year are made from manufactured and natural brine, or salt water. About 7,000,000 tons of salt are left in the form of brine to be used by chemical and other industrial companies. Michigan, New York, Ohio, and Louisiana lead all other states in salt production. Kansas, California, Texas, and West Virginia also produce large amounts of salt. In Canada the province of Ontario produces the most salt. Ontario salt is taken from the brines of a salt basin which is about 3,000 square miles in area.

The richest salt fields in Europe are the Carpathian mines in Austria, where high-ceilinged rooms and huge pillars of salt cover a thirty mile area beneath the surface of the earth. In the lower levels of the salt mine, there are streets and houses for the miners. Some of the largest salt mines in the world are at Wieliczka, Poland, only eight miles from Krakow. At the Wieliczka mines, some salt veins are located 900 feet below the earth's surface. This mine has been yielding salt for almost a thousand years.

### Uses of Salt

There are about 1,400 different uses for salt. Most persons think of salt as being used mostly to season foods in the kitchen, but this is one of the least important uses of salt. The largest users of salt are meat packers, chemical industries, hide and leather processors, and food processors, such as bakers, cereal manufacturers, and the manufacturers of butter, cheese, and other dairy products. Textile processors, soapmakers, ice and refrigeration industries, munitions industries, glass industries, and agricultural industries also use salt in large quantities.

The farmer feeds salt to his livestock and uses it as a preservative for hay in storage. Factories, plants, laundries, and other industrial institutions use salt in water-softening and water-conditioning systems. Salt is also used as a stabilizer in building secondary roads. Salt mixed with snow or ice forms a solution with a lower freezing point than that of water. That is why salt melts snow and ice, and why it helps to freeze ice cream.

The antiseptic properties of salt make it useful in medicine as well as in food preservation. It is dissolved in water for such simple preparations as eye baths,

mouthwashes, body rubs, and foot baths.

D.P., Jr.

See also GREAT SALT LAKE.

### Questions

Where in the world are there whole towns built in salt mines?

What is the connection between salt and our word *salary*?

How much salt is there in a gallon of sea water?

How much salt would be left if all the seas dried up?

Which are the saltiest seas in the world?

How is salt mined?

How is salt removed from wells?

**SALT.** In chemistry, a salt is one of the most important kinds of chemical compounds. Common table salt is sodium chloride. It is the best known of the group, and gives the name salt to all the others. Most salts form crystals, and many dissolve easily in water.

Salts are made up of ions — charged atoms of elements, or groups of atoms. The ion with the positive charge is usually a metallic ion. The ion with the negative charge is usually composed of one or more non-metals.

A salt may be defined as the compound produced (in addition to water) when a base and acid neutralize each other. Acids contain positive hydrogen ions together with some kind of

negative ion. Most bases contain a negative hydroxyl ion with a positive ion. When the acid and base come together the hydrogen and hydroxyl ions join to form water. The positive ions of the base and negative ions of the acid form the salt. The chemical names of the different salts tell what kind of acid and base they are formed from.

Salts that contain no hydrogen or hydroxyl ions are called *normal salts*. Others contain some hydrogen ion besides the other positive ion, and are called *acid salts*. *Basic salts* contain a hydroxyl ion besides the usual negative ion. In many salts one or more of the ions is a radical, a group of elements. For example, bicarbonate of soda is an acid salt,  $\text{NaHCO}_3$ .  $\text{Na}^+$ , the sodium ion, is the positive ion.  $\text{H}^+$  is the positive hydroxyl ion.  $\text{CO}_3$  is a radical, the negative carbonate ion.

Many chemical elements, both metals and nonmetals, are found in nature as salts.

G.L.Bu.

**Related Subjects.** The reader is also referred to:

Alum	Nitrate	Soda
Carbonate	Oxalic Acid	Sulfate
Chloride		

**SALTAIR.** See GREAT SALT LAKE.

**SALTBUSH.** See AUSTRALIA (Natural Resources [Plant Life]).

**SALT CITY, THE.** See SYRACUSE, N.Y.

### Eight Leading Salt States

Michigan



New York



Ohio



Louisiana



Kansas



California



Texas



West Virginia



Each symbol stands for  
300,000 short tons  
Based on Government Statistics  
for a 4-year period

PICTOGRAPH CORPORATION



**SALTEN, ZÄHL ten, FELIX** (1869-1945), was an Austrian novelist and essayist. He is probably best remembered for his stories about Bambi, a wild deer. *Bambi* became a best seller in America. Walt Disney made a feature-length animated cartoon from the story.

Salten was born in Qfenpest. He wrote for *Die Zeit* and other journals. In 1939, when the Nazis took control of Austria, he fled to Switzerland. P.A.W.

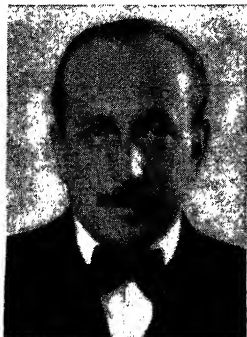
**His Works** include *City Jungle*; *Fifteen Rabbits*; *Hound of Florence*; *Samson and Delilah*; *Florian, the Emperor's Stallion*; *Bambi's Children*; and *Good Comrades*.

**SALTILLO.** See MEXICO (Cities).

**SALT LAKE.** See GREAT SALT LAKE.

**SALT LAKE CITY,** Utah (population 149,934). This state capital is often called the most beautifully situated city in America. It lies at the foot of the high Wasatch Mountains, above Salt Lake Valley. Salt Lake City is an important business and industrial center. More precious ores are processed, or *smelted*, in the vicinity of Salt Lake City than in any other place in the world. One of the chief Mormon settlements in the United States is located in Salt Lake City.

**Location, Size, and Description.** The city is situated in a rich farming and mining region. The Great Salt Lake is about fifteen miles to the west. All the streets in the



Simon and Schuster

**Felix Salten** wrote animal stories for young people.

city run directly north and south or directly east and west. The State Capitol, with a dome 285 feet high, stands north of the city. Fort Douglas, a United States army post covering fifteen square miles, joins the city on the east.

**Cultural Life.** Salt Lake City is the home of the University of Utah, Westminster College, and St. Mary of the Wasatch College (for girls). The city is the headquarters for the Church of Jesus Christ of Latter-day Saints, whose people originally settled this region. The granite Mormon Temple, with its six spires, stands in Temple Square. Here also is the famous Tabernacle with its huge organ. Near by is the famous Sea Gull monument, which was erected "in grateful memory" to the gulls which ate the crickets that were destroying the crops of the pioneers in 1848.

**Industry and Trade.** The city is the headquarters for a district of silver, lead, copper, and gold mines. Salt Lake City also is an important banking center. The city has oil refineries, dairies, flour and woolen mills, fruit and vegetable canneries, candy factories, and sugar- and salt-processing plants.

**History.** The Mormon Pioneer party came to the site of the city on July 24, 1847. When the Mormon leader, Brigham Young, saw the beautiful valley in which the city now lies, he said, "This is the right place, drive on!" meaning the place he had seen in a vision. The first crops were planted the same day. J.C.AL.

#### Questions

How does Salt Lake City rank as a smelting center for the ores of precious metals?

What interesting monument stands in this city?

What are some of Salt Lake City's manufactured products?

When and how was the first settlement made?

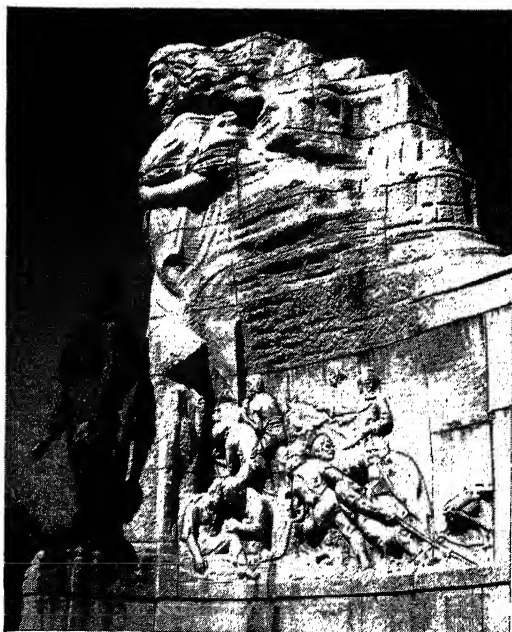
How far is Salt Lake City from Great Salt Lake?

**SALT LICK.** See SALT (Salt from the Mine).

**SALTO.** See URUGUAY (Cities).

**SALTON, SÄWL tun, SEA.** This body of water in southeastern California is not a sea, but a lake. Furthermore, it is a lake that is gradually drying up because man wants it to. Early in the 1900's, engineers for a private irrigation project dug a channel to carry water from the Colorado River to the Imperial Valley of California. But they took no precautions to control the flow of water, and in 1905 and 1906 the river flooded the valley and entered the Salton Sea, where it formed a salty lake about 400 square miles in area. The overflow threatened to ruin the rich farming valley, and in time, to form a body of water larger than the Great Salt Lake of Utah. The disaster was prevented by the rapid work of the irrigation company, the Southern Pacific Railway, and the United States Bureau of Reclamation. Millions of dollars were spent to guide the river back to its course. All possible water inlets to the Salton Sea basin were blocked off, and the lake is now gradually evaporating at the rate of five or six feet each year.

The lake now covers about 280 square miles chiefly in Imperial County between the Santa Rosa and Chocolate mountains. It is 246 feet below sea level, and the Imperial Valley is the largest area below ocean level in North America. The region is believed to have once



Ewing Galloway

**This Monument to the Mormon Volunteers** stands on the Utah Capitol grounds in Salt Lake City. During the Mexican War, the Mormon battalion made the longest infantry march on record, from Leavenworth, Kan., to San Diego, Calif.



Gunpowder



Matches



Meat Preservative

## SOME USES OF SALTPETER

Dyes



Fireworks



Ore Smelting



been a part of the Gulf of California, from which it was shut off by the river building the Colorado Delta.

Part of the Salton Sea area has been set aside as a Federal bird refuge.

L.D., JR.

**SALTPETER**, or **NITER** (chemical formula,  $\text{KNO}_3$ ), is a mineral which resembles common salt. Saltpeter is known chemically as potassium nitrate. It is formed in the earth when decayed plant and animal matter ox-

idizes, or combines with oxygen. Saltpeter is found in large amounts in certain parts of Spain, Egypt, the United States, and India. In addition to being mined from the earth, a great deal of saltpeter is manufactured in the chemical laboratory by combining potassium chloride ( $\text{KCl}$ ) and sodium nitrate ( $\text{NaNO}_3$ ). It is also found in large limestone caves, such as Mammoth Cave.

Saltpeter comes in tiny white six-sided crystals. These crystals dissolve easily in water and taste salty. Saltpeter is used in the manufacture of gunpowder. It is also used in manufacturing fireworks and matches. Because it is a mild antiseptic, saltpeter is sometimes used in preserving meats. It is also used in the smelting of certain ores, and, to some extent, in dyeing.

Another type of saltpeter is known as Chile saltpeter because it is mined in Chile. Chile saltpeter is known chemically as sodium nitrate. It is used as a fertilizer, in the manufacture of fireworks, in the making of nitric acid, and in making fluxes for solder.

G.L.BU.

**SALT RIVER.** This stream in south-central Arizona is formed by the joining of the White and the Black rivers in Gila County. From here the Salt River flows west for 200 miles and empties into the Gila River near Phoenix. The Salt River Valley is irrigated by five dams, which form a series of lakes sixty miles long on the Salt River.



**Location Map of the Salton Sea, California**, showing the largest area it covered before it started to recede

**SALTS** is a name popularly given to saline laxatives. The more important are *Epsom salt*, or magnesium sulfate, *Glauber's salt*, or sodium sulfate, and *Rochelle salt*, or sodium and potassium tartrate. They produce bowel movements by causing water to accumulate in the intestine. Salts are sometimes prescribed by physicians, but best medical authorities advise against use of any saline laxative to any extent. Such use may cause chronic irritation in the intestine, and may even interfere with food absorption. See also **EPSOM SALT**; **GLAUBER'S SALT**; **SEIDLITZ POWDERS**.

**SALT SPRINGS DAM** is the highest and largest rock-fill structure of its type in the United States. It is part of a power project on the North Fork of the Mokelumne River in California. The Salt Springs Dam is 332 feet high, and has a crest 1,300 feet long and 15 feet thick. It controls a volume of 3,000,000 cubic yards of water. The dam was built by the Pacific Gas and Electric Company. Salt Springs Dam was completed in 1931 at a cost of \$6,930,000. See also **DAM**.

**SALT-WATER FISH**. See **FISH** (color plates).

**SALTWORT**. See **ALKALI**; **FLOWER** (color plate, *Flowers of the Seaside*).

**SALTYKOV**, *sul tih KAWF*, **MIKHAIL** (1826-1889). See **RUSSIAN LITERATURE** (Nineteenth Century).

**SALUDA**, *sah LOO dah*, **DAM** is the second largest earth-fill dam in the United States. It is part of a power project on the Saluda River, ten miles upstream from Columbia, S.C. Saluda Dam is 208 feet high and is a mile and a half long at the top. The dam was completed in 1930 by the Lexington Water Power Company at a cost of \$6,000,000. See also **DAM**.

**SALUDA RIVER**. See **SOUTH CAROLINA** (Physical Features).

**SALUTE**, *sah LOOT*, is a gesture of greeting showing courtesy or recognition. In the armed forces it is a mark of respect which men of lesser rank show to the uniform of superior officers.

United States Army regulations require that the hand salute be made at a distance of not more than thirty paces and not less than six paces. The right hand is raised with the index finger to the peak of the cap. The forearm is held at a forty-five degree angle. Soldiers salute with or without head covering and must look directly at the officer when saluting.

Navy men do not salute without head covering. Aboard ship, sailors are required to salute an officer only at the first meeting during the day, except when reporting in the course of duty. Sailors must salute the quarterdeck where the flag flies when boarding or leaving their ship. Soldiers and sailors must stand at attention and give the salute during the playing of the national anthem. They must also salute when passing or being passed by the flag. It is customary for civilians to salute the flag by holding the right arm across the breast, and to stand at attention during the playing of the national anthem.

Soldiers carrying rifles "present arms" to higher ranking officers. This is done holding the rifle before the body in a vertical position. Men do not salute while smoking or while uniform coats are unbuttoned. Only soldiers in good standing are allowed to salute. Prisoners are not allowed to salute.

High-ranking personages, especially visitors from for-

eign countries, are often saluted by the firing of cannon. The number of rounds fired depends on the standing of the visitor. United States warships salute the President with twenty-one rounds.

The armed forces of other countries require saluting in ways generally like those of the United States. The Fascist salute in Germany and Italy before and during World War II was the extending of the right arm forward, heightened at an angle with the palm downward.

The clenched fist salute with the right hand is associated with the Soviet Union and some other countries of Europe, especially Spain before and during the Franco rebellion and in Yugoslavia after World War II.

Fliers often extend greetings in salute by dipping, or tilting, the wings of their planes. Ships passing on the high seas salute each other with one long blast on the ship's whistle. Ships in foreign ports raise the national flag of the countries they visit as a salute to the hospitality of the country.

R. COL.

See also **FLAG** (illustration, *How to Honor the Flag*).

**SALVADOR, EL**. El Salvador is the smallest and most thickly populated of the Central American republics. It is a colorful tropical country, with rich forests and fertile farm lands. The name *El Salvador* is Spanish for *The Savior*.

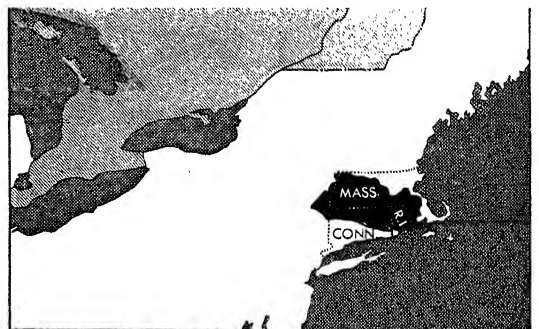
#### The Land and Its Resources

**Extent:** Area, 13,176 square miles; greatest length, 170 miles; greatest width, 60 miles.

**Physical Features:** *Chief river*, Lempa. *Chief lakes*, Guija, Ilopango. *Chief gulf*, Fonseca. *Elevation*, highest, Santa Ana, 7,825 feet above sea level; lowest, sea level.

**Location, Size, and Surface Features.** El Salvador is bordered on the north by Guatemala and on the east by Honduras. It faces the Pacific Ocean, and has no Atlantic coast line. For the boundaries of El Salvador, See **CENTRAL AMERICA** (colored map).

A low plain about fifteen miles wide lies along the coast of El Salvador. This area is called the *hot lands*. The rugged plateau of Central America rises back of the narrow coastal plain. The surface of the plateau is broken by irregular chains of mountains and by volcanic



Areas of Salvador (Black) and Eastern U.S. Compared

peaks. Some of these peaks are more than 7,000 feet high. Izalco, the most famous of El Salvador's volcanoes, has been active for more than a hundred years. The south-central part of El Salvador has many earthquakes.

**Rivers and Lakes.** The chief river of El Salvador is the Lempa, which flows into the Pacific. The magnificent

# EL SALVADOR



## "BALSAM OF PERU"

This medicinal sirup comes from a tree found only in El Salvador. It was so called because it was sent to Spain from the port of Callao in Peru.



## THE RISING ISLAND

In 1880, after Lake Ilopango had overflowed, an island 500 feet in diameter and 150 feet high rose from the water.

Lempa River Valley, north of the main plateau, is the most fertile region of El Salvador. The Lempa is partly navigable for small steamers, but is little used. El Salvador has a number of lakes in the craters of dead volcanoes. Lake Ilopango is a popular resort near the capital.

**Climate.** The plateau of El Salvador has an even, healthful, mild climate. The climate in the coastal lowlands is warmer and wetter than it is in the inland region. The rainy season lasts from May to November and is called "winter." The rest of the year is "summer." The average yearly rainfall varies from 40 to 100 inches and is heaviest on the coast.

**Natural Resources.** The fertile soil of El Salvador is the country's chief source of wealth. Rich forests of valuable timber grow on the hot, tropical coast of El Salvador. Some of the trees produce a very valuable sap called "balsam of Peru." It is used in medicine and surgery and is found only in El Salvador. The country also has mineral deposits of gold, silver, copper, iron, and quicksilver.

## The People and Their Work

**Population:** Estimated, 1,896,168. **Density,** 139 persons per square mile. **Distribution,** rural, 63 per cent; urban, 37 per cent.

**Chief Products:** Coffee, corn, sugar, cocoa, beans, balsam, rubber, tobacco, rice, cattle.

**The People.** Most of the people of El Salvador are *mestizos*, or people of mixed Spanish and Indian blood. There are only a few thousand whites, but about 10 per cent of the people are pure Indians. El Salvador has very few Negroes. Spanish is the official language of the country.

**Agriculture.** Most of the people of El Salvador live in the Lempa River Valley and get their living directly from the soil. The greater part of El Salvador is cultivated. But El Salvador is almost a "one-crop country." Coffee far outranks all other products. The coffee plant flourishes on the high plains and lower mountain slopes. El Salvador does not produce the best quality of Central American coffee, but it can compete with other areas



## GREAT COFFEE EXPORTER

El Salvador is the largest coffee exporter in Central America and the fourth largest in the world.

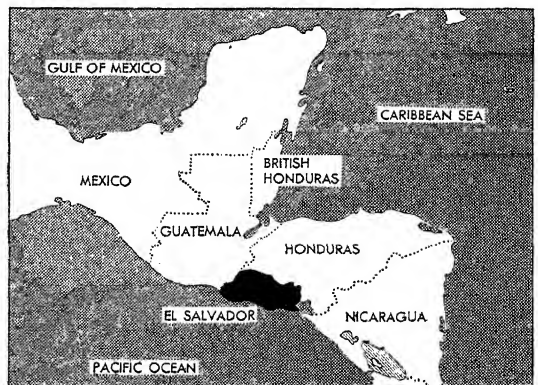
because its coffee fields lie close to the seaports.

Other agricultural products of El Salvador include sugar, beans, cocoa, rubber, cotton, tobacco, and henequen, from which twine is made. Corn, beans, and rice are raised for home use as food. Most of the farms are small family holdings and are worked by crude methods. Modern farming machinery is used on the large estates. The crops of the smaller farms are often processed on the estates. The government is trying to change the country's dependence upon the coffee crop. Farmers who grow cotton for export receive bonuses from the government.

**Minerals and Manufactures.** Mining is an increasingly important industry in El Salvador. But manufacturing is not very important. There are some sugar refineries, flour mills, distilleries, starch factories, cordage works, and mills for cleaning coffee beans.

**Trade.** Before the opening of the Panama Canal, El Salvador's foreign trade was largely with the United States, Great Britain, and Germany. The canal turned most of El Salvador's foreign trade northward to the United States. Today nearly 90 per cent of El Salvador's trade is with the United States.

The chief exports are coffee, gold, silver, copper, and sugar. Henequen, abacá or Manila hemp, balsam,



Location Map of El Salvador

tobacco, and indigo are also exported. The chief imports are cotton and woolen materials, hardware, flour, drugs, and chemical products.

**Transportation and Communication.** El Salvador has only 384 miles of railroads. But the country has 1,476 miles of government-controlled roads. El Salvador's share of the Pan-American Highway was completed in 1939. Steamship lines connect the various coastal cities. The inland cities are connected by roads or railroads with the ports and with other Central American cities.

Postal, telephone, and telegraph systems cover most of El Salvador. Radio broadcasting stations have been established. Several commercial air lines connect the republic with the outside world.

**Cities.** The leading cities of El Salvador were settled early in the 1500's. San Salvador, the capital of El Salvador, is described under its own name in THE WORLD BOOK ENCYCLOPEDIA. Other important cities are described below.

**Acajutla**, *ah kah HOOT lah* (population 1,080), is a port which serves the western and central parts of the country. The port has modern loading and unloading facilities, and handles a large part of El Salvador's coffee exports.

**La Libertad**, *LEE ber TATH* (population 23,755), is the chief tourist and passenger port of El Salvador. It is sometimes called New San Salvador. La Libertad lies twenty-three miles from the capital and is a port of call for a number of steamship lines.

**La Union**, *oo NYOHN* (population 9,118), is situated on the beautiful Gulf of Fonseca, 155 miles from the capital. It is the chief port of El Salvador, and handles about two thirds of the country's imports.

**San Miguel**, *sahn mee GEL* (population 18,930), is an important trading and manufacturing center. Coffee, sisal fiber, indigo, and cotton are processed there. Gold and silver mines lie near by, and the metals are brought into the city's mills and markets.

**Santa Ana**, *SAN tah AN ah* (population 46,343), is an important business center and the second largest city of El Salvador. It lies forty-eight miles northwest of San Salvador. Santa Ana handles a large part of the republic's coffee business, and is a terminal for the Salvador Railway.

#### Social and Cultural Achievements

**Social Conditions.** The land in El Salvador is fairly well divided among the people. The population is three times as large as it was sixty years ago, and there is a widespread moderate prosperity.

The small white population rules the country. Both Indians and mestizos leave politics to the whites and take little part in public affairs. As a whole, these classes work harder and quarrel less than the people of near-by Honduras and Nicaragua. But conditions in El Salvador are still primitive, especially in the rural areas.

**Education and Religion.** Only about a fourth of the children of school age attend school. There are some good schools in the cities. But there are few schools in the country, and most of these do not give instruction beyond the third-grade level. The National University at San Salvador has an average yearly enrollment of 480 students. Almost all the people of El Salvador are Roman Catholics, but there is complete religious freedom.

#### Government

The constitution of El Salvador was adopted in 1886. The president is elected for a term of six years. He is

assisted by a cabinet of four ministers. The congress is a single body of forty-two members. Each member is elected for a term of one year. All men are required by law to vote. Women may vote if they choose.

The president of El Salvador usually holds supreme power. The government is a kind of dictatorship. In 1939 the president called a Constitutional Congress which changed the constitution. The president's powers were increased and his term of office was extended to 1949. But in 1944 the Constitutional Congress re-enacted the constitution of 1886.

The government of El Salvador has a good financial reputation. The unit of currency is the *colon*, which is worth about forty cents in United States money. Through the years the national debt has been gradually reduced.

**International Relations.** The United States has influenced El Salvador's foreign policy for many years. El Salvador was the only Central American republic which did not declare war on Germany in World War I, but it opened its ports to United States war vessels. In December, 1941, El Salvador declared war on Germany and Japan.

#### History

El Salvador was conquered by Alonso de Alvarado in 1524. It remained a Spanish colony attached to Guatemala until 1821. In that year El Salvador revolted and won its independence from Spain. El Salvador then became part of the Central American Confederation. Francisco Morazán, leader of the Confederation, made San Salvador his headquarters after he had been driven from Guatemala.

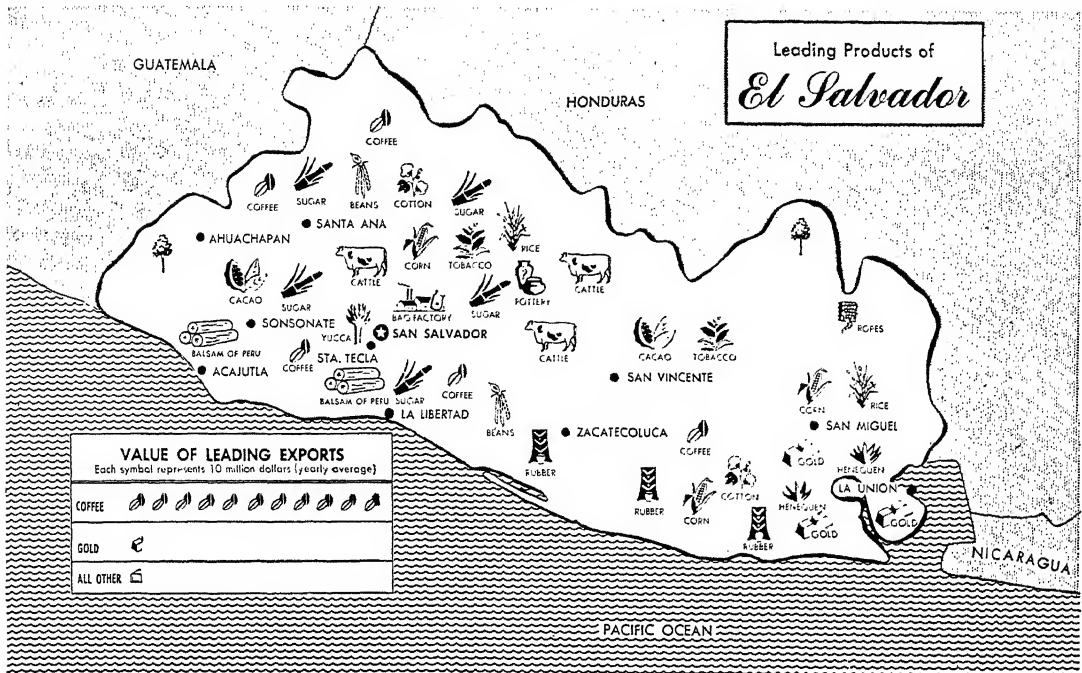
The Confederation was finally broken up in 1839, and almost sixty years of disordered military rule followed. In 1898 El Salvador made another of its numerous attempts to form a union with Nicaragua and Honduras. Local dissatisfaction with conditions in the republic brought Tomás Regalado to the presidency. He was the first of a line of efficient dictators who were drawn from the wealthy families of El Salvador. The country prospered under Regalado and leaders who followed him.



John Strohm

**Kernels of Corn Are Washed** in a stream before being crushed into the dough which is used to make tortillas.





Based on latest statistics, prepared for the exclusive use of the WORLD BOOK ENCYCLOPEDIA by Pictograph Corporation

Since about 1900, El Salvador's neighbors have interfered less in the country's affairs. This has meant more peace and prosperity for El Salvador. Strong presidents have guided El Salvador during this period. The powerful Meléndez family controlled the country from 1913 to 1927. In 1931 Maximiliano Martínez seized the presidency and held it by military might until 1944.

The United States finally recognized the Martínez government after the other Central American republics had reluctantly granted recognition. Martínez ruled fairly well for thirteen years, but at the price of bloodshed and violence. In 1944 Martínez was overthrown and driven into exile. Colonel Osmin Salinas, the leader of the revolt, became president. In 1945 Salinas turned the presidency over to another conservative, Salvador Castro. A conference was then held between Guatemala and El Salvador. The two countries agreed to adopt similar customs laws and immigration laws, and a common system of coinage. They invited the co-operation of the other Central American republics, and the old Central American idea of unity again appeared. I.J.C.

See also BALSAM OF PERU; COFFEE; DELGADO, JOSÉ MATÍAS; FLAG (color plate, Flags of Latin America); SAN SALVADOR.

#### Questions

What does the name *El Salvador* mean in Spanish?

How does El Salvador compare in size and population with other Central American republics?

When does "winter" come in this country? What kind of weather does it bring?

What is "balsam of Peru" and for what is it used?

Where do most of the people of El Salvador live?

How did the opening of the Panama Canal affect El Salvador's trade?

Which cities handle much of the country's coffee business?

**SALVAGE**, *SAL* *vij*, is money or goods paid to those who save ships or cargo abandoned at sea. Help which is given to a vessel in distress or danger is called salvage service. In Great Britain salvage is granted only for acts on the high seas. In the United States it is allowed by courts for saving goods, ships, and life on inland waters as well as on the high seas.

The *salvor* is a person who helps to save a ship other than that which he is assigned to sail. A salvor can not collect salvage for helping to save his own ship. Salvage can be collected only for the saving of a ship which sails under her own power. It is not granted in the case of a barge or other floating structure moored to a shore or dock. The danger from which a ship is salvaged must be real, not something which might happen. The ship saved must be brought to a safe place, ready to be returned to its owner for repair.

Some countries have fixed by law the amounts to be paid in salvage cases. The United States and Great Britain have no such laws. American and British courts grant salvage claims based on conditions under which the act has been performed. It is usual to pay amounts substantially more than are generally paid to seamen for regular work.

Division of salvage among the salvors also rests on the decision of the courts. The master's share is usually double that of the mate's. The mate's share is usually double that of a seaman. The share of the men who do the work and sail the salvaged ship back to port, is usually double that of those who remain aboard the salvor vessel. The greatest amount ever recovered from a sunken ship was the \$24,793,540 brought up from the British liner *Lawrentic*, which was sunk by a German torpedo off the coast of northern Ireland in 1917.

The term salvage is sometimes applied to the recovery



**The Salvation Army Combines Religious Teaching with its practical work of giving food, shelter, and clothing to those**

in need. This group of workers joins in singing an old hymn during devotional services in a field office.



**The Salvation Army Maintains Nurseries, among its many activities in social welfare. The worker here is caring for a**

group of preschool children in the waiting room of a dental clinic. The children are treated free of charge.

of goods and property from emergencies on land, such as fires and floods. R.COL.

See also DIVING (illustration, Deep-Sea Diving).

**SALVARSAN**, *SAL ver san*. See EHRLICH, PAUL.

**SALVATION ARMY** is a world-wide Christian religious body with semimilitary organization. It is first of all a practical organization, which gives food, shelter, and clothing to those who need it most. After physical needs are attended to, the Army ministers to the spirit. It brings religion to many whom the churches never reach, for hunger and cold often stand in the way of spiritual salvation.

The Salvation Army maintains food depots, homes for girls, industrial homes where men rebuild their character, hospitals, low-cost lodging houses, nurseries for babies of working mothers, fresh-air camps, boys' clubs, and welfare work programs for prisoners.

An unusual feature of the Army is its street-corner musicians, who play and sing and preach the glory of God. Indoor religious meetings usually follow. In country after country this method of spreading the Gospel has succeeded in winning converts and collecting funds.

The Salvation Army has over 27,000 officers, both men, and women. During World War I its "lassies" carried food and hot coffee and an encouraging word to soldiers throughout France. During World War II its mobile canteens were welcome sights on all fronts, and it established more than two thousand rest and recreation centers for service men and women. The Army was largely responsible for the forming of the United Service Organizations (USO). Wherever disaster has suddenly wrecked homes, families, or individuals, the Salvation Army has stepped forward with aid. The organization's official paper is the *War Cry*.

**History.** "General" William Booth, a Methodist minister, conducted meetings to bring the Gospel to the poor people of London's East End slums in 1865. His work was well received, and he organized the Christian Mission. In 1878 the Mission changed its name to the Salvation Army, designed uniforms for both men and women officers, and adopted a semimilitary system of leadership. The cause spread through the world. The Army was established in the United States in 1880, and today it operates in more than two thousand centers.

After Booth's death in 1912, his son Bramwell became General. He was succeeded by Edward J. Higgins. The founder's daughter, Evangeline Booth, became the next General, and in 1939 George Carpenter took over leadership. Albert Osborn became General in 1946. See also BOOTH. D.McM.

**SALVIA**, *SAL vih ah*, is the name of a genus of herbs and shrubs. All these plants have flowers which are two-lipped. The colors of the flowers range from white to scarlet, and may be purple, violet, blue, or yellow. A number of species are grown in gardens and others are used for cooking or medicines. The best-known garden salvia is the *scarlet sage*, which is native to Brazil. It is a shrub which grows to eight feet in height, and is cultivated as an annual plant. Its flowers are scarlet. See also FLOWER (Planting Table). A.C.Ho.

**Classification.** *Salvia* is a genus in the *Labiatae* family. The scarlet sage is *S. splendens*. The sage used in cookery is *S. officinalis*.

**SALVINI**, *sahl VEE nee*, **TOMMASO** (1829-1916), was an Italian actor. He was best known for his original interpretations of Hamlet and Othello as cruel and heartless characters. Salvini, the son of actors, was born in Milan. He began to act when he was fourteen and soon became a famous tragedian. In 1873 he made his first trip to America and played Othello with Edwin Booth. Salvini retired in 1890 and lived in Rome. B.H.C.

**SALWEEN**, or **SALWIN**, is the second most important river in Burma. It rises in the southeastern corner of Tibet, in the highlands of central Asia, and flows through eastern Burma to the Bay of Bengal. It empties into the ocean near Moulmein. The Salween is 1,750 miles long, and drains eastern Burma and western Siam.

Because much of the Salween River lies in a deep gorge, surrounded by towering mountains and plateaus, it has little value as a commercial waterway. In its lower course the river is highly important for irrigating farm crops. The Salween Delta is one of the most fertile sections in Burma. Rice is raised in areas where the river runs on a level course. There is so little level land in the middle part of the course that most of the people live at heights more than a mile above sea level. They farm on the hillsides, often clearing the land by burning the forests which grow on the slopes of the mountains.

The upper Salween River is crossed by a suspension bridge which is a vital transportation link along the famous Burma Road. During World War II, the bridge was bombed several times by the Japanese. The bridge received several direct bomb hits, but the traffic on the Burma Road was never stopped for more than forty-eight hours. When the bridge was being repaired after bomb damage, native laborers ferried war materials



J. Horace McFarland

Flowers and Leaves of the Scarlet Sage (a *Salvia*)

across the Salween to supply the Allied forces. G.B.C.R.

See also RIVER (illustration, Longest Rivers of the World).

**SALZBURG**, *ˌzAHLTz boork* (population 40,232), is a city in the mountains of northwestern Austria, about one hundred miles southeast of Munich. It is best known for its annual music festivals which attract music lovers from all parts of the world. See also AUSTRIA.

**SAMAR**, *SAH mahr*. See PHILIPPINE ISLANDS (Principal Islands).

**SAMARA**, or **KUIBYSHEV**. See UNION OF SOVIET SOCIALIST REPUBLICS (Cities).

**SAMARIA**. See PALESTINE (Cities).

**SAMARITAN**, *sah MAR ih tan*. The Samaritans were originally the people who lived in the north of Israel after the fall of the kingdom in 722 B.C. Their chief city was Samaria; then this name came to mean the district, and so the people living in it were called Samaritans. Some of these had been brought there by the Assyrian king, who had captured and taken away many of the Jewish people who were living there. But the people of Samaria were mostly Hebrew, and the newcomers adopted their religion and institutions.

About a hundred years later, after King Nebuchadnezzar had destroyed Jerusalem, Jewish life began slowly to revive in Judah, south of Samaria. The Samaritans then tried to co-operate with the Jews in re-

building their temple. In spite of friendly relations and considerable intermarriage, the Jews scorned their offer. They were influenced by their leaders, Haggai, Zechariah, Nehemiah, and Ezra. It was said that the Samaritans would contaminate the Jews. The Samaritans finally broke off relations with the Jews and built their own temple. It is believed this breaking off occurred at the time Alexander came to Palestine, about 332 B.C. They never again established friendly relations.

The Samaritans may be described as the oldest Jewish heretical sect. Their Bible is the first five books of the Old Testament, but they do not accept the rest. A very small community of Samaritans still lives at Nablous, in central Palestine. W.A.I.

**SAMARIUM**, *sah MAI' rih um*. See ELEMENT, CHEMICAL (Table of the Elements and Their Discoverers).

**SAMARKAND**. See UNION OF SOVIET SOCIALIST REPUBLICS (Cities).

**SAMA-VEDA**. See VEDA.

**SAMBAR**, *SAM ber*. See DEER (Other Important Kinds of Deer).

**SAMBRE**, *SAHN br'*, RIVER. See BELGIUM (Rivers).

**SAMBUKE**, *SAM byook*. See ELDER.

**SAM HOUSTON STATE TEACHERS COLLEGE** is a coeducational school in Huntsville, Tex. Courses are offered in the liberal arts, business education, professional work, and vocational training for teachers. Both



'**he Good Samaritan Aiding the Wounded Jew** is a parable told by Jesus to show the brotherhood of man, regardless of race or creed. Samaritans were considered heretics by

the Jews. The parable tells of a Jew who was robbed, beaten, and left by the roadside to die. Two Jews saw him and passed on. The Samaritan came to his aid and took him to an inn.

men and women are required to live in college dormitories or approved boarding houses. General Sam Houston's old home is on the campus. The college was founded in 1879 and has an average enrollment of about 1,500. H.L.O.

**SAMNITE** was the name of an ancient tribe of people of Sabine origin who lived in the mountains of southern Italy. The Samnites were nearly wiped out after four wars with the Romans.

**SAMOA**, *sah MO ah*, is a group of twelve islands in the South Pacific Ocean. They lie about 4,200 miles southwest of San Francisco, Calif. The Samoa Islands were once called the Navigators Islands. Nearly all the islands are volcanic formations, and most of them are surrounded by coral reefs. The islands cover an area of 1,200 square miles, and have a population of 76,671.

Before World War I, Germany and the United States shared the ownership of Samoa. Germany owned the Samoan territory west of the 171st meridian of west longitude. The United States owned the islands east of this meridian. At the outbreak of war in 1914, British troops seized the port of Apia on the German island of Upolu. In 1920 the League of Nations awarded all of German Samoa to Great Britain. This territory is officially known as the Territory of Western Samoa.

The two largest island groups in British Samoa are Savaii and Upolu. For many years Upolu was the home of Robert Louis Stevenson. The grave of the famous writer is on Mount Vaea, near the town of Apia. Apia is the chief town and seat of government for the island of Upolu.

**American Samoa.** Since 1900 the United States has owned the Samoan islands east of the 171st degree of west longitude. The islands came under American control as a result of a treaty signed by Great Britain, Germany, and the United States.

The government of American Samoa is under the supervision of the United States Navy Department. Tutuila is the most important American possession in Samoa. The island covers an area of forty square miles, and has a population of 9,842. America has had a naval and coaling station on the island since 1872. The port of Pago Pago, on Tutuila, is the only good harbor in Samoa. The United States naval base on Tutuila is an important link in the chain of American Pacific bases. Other islands in American Samoa include the Manua group and Swain's Island.

**General Description of the Samoan Islands.** Most of the Samoan Islands are very colorful. Mountain slopes dip into fertile valleys. Rich forests and flat lands slope gently toward the sea. The climate is generally pleasant, but gales and hurricanes sometimes sweep the islands between January and March. The thick forests of Samoa have many different kinds of trees, including sixteen types of coconut palm trees, and twenty kinds of breadfruit trees. The islanders export copra, which is the dried meat of the coconut. Other important products are cacao and bananas. In American Samoa, the natives raise oranges, limes, mangoes, and alligator pears. The only animals on the islands are rats, snakes, and a few birds.

The native Samoans are Polynesians. They are tall, well built, brown-skinned, and good-looking. They are

a simple folk, but generous and honorable in their habits. Most Samoans are Christians, but they do not have the elaborate church services of western Christians. E.E.E.I.

See illustration on following page; also RACES OF MAN (color plate).

**SAMOS**, *SAT mahs*, is a Greek island in the Aegean Sea. It lies in the Grecian Archipelago, and is separated from the coast of Asia Minor by the Strait of Little Bosphorus. Samos once belonged to Turkey. It became a Greek island in 1923, under the terms of the Treaty of Lausanne. Samos covers an area of about 180 square miles, and has a population of 77,858. Most of the inhabitants are Greek. Limen Vatheos, the island capital, was a magnificent city in the ancient days of Greece.

Natives of Samos raise olives and grapes. Exports include olive oil, wine, silk, cotton, and figs. The island has small deposits of marble, silver, iron, lead and emery. W.E.E.

See also POLYGRATES.

**SAMOSSET**, *SAM oh set* (1590?-1655), was one of the early Indian friends of the Pilgrim settlers of the Plymouth Colony. He was a chief, or *sagamore*, of the Pemaquid Indians, and apparently first came into con-



Historical Pictures

**Samoset's First Appearance in Plymouth Colony** startled the colonists, who thought he was a dangerous savage. But Samoset proved to be a loyal and helpful Indian friend.

tact with Englishmen when he met some fishermen along the coast of Maine. He learned a little English from them, and in March, 1621, he startled the Plymouth colonists by appearing on the street and exclaiming, "Welcome, Englishmen!" He introduced the leaders of the colony to Massasoit, the Indian chief of the Plymouth area. In 1625 Samoset made what is believed to be the first deed of Indian land to English colonists. He transferred 12,000 acres of his tribe's land to John Brown, one of the settlers. T.R.H.

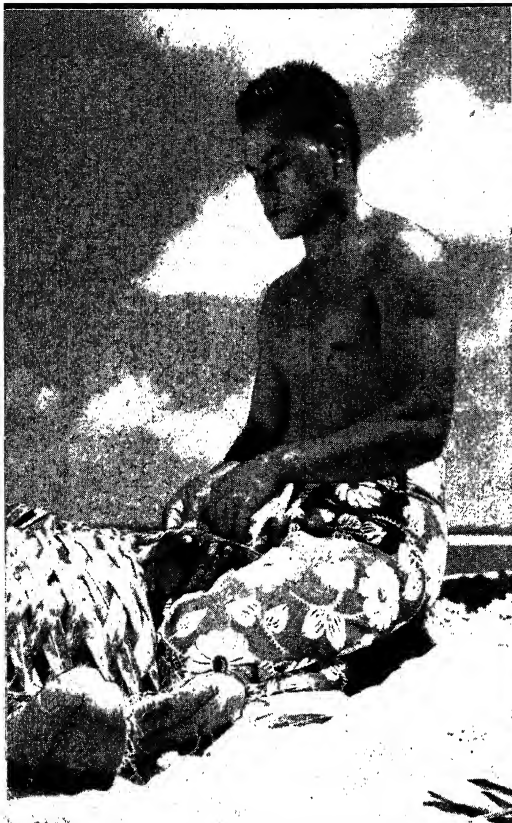
See also MASSASOIT; SQUANTO.

**SAMOTHACIAN**, *SAM oh THRAY shan*, **MYSTERIES.** See MYSTERIES.

**SAMOYED**, *SAM oh YED*, is the name of a tribe of Mongol people who live in the arctic region of the northern Soviet Union. They are much like the Laplanders and the Eskimo.

**SAMOYED** is a dog bred by the Samoyed peoples of Siberian Mongolia. It is one of the dogs called lupines, which also include spitz and chow. The Samoyed is





**Dried Husks of Coconut** provide the fiber used by this basket weaver, working on the sands near the blue sea.



**A Samoan Fisherman** repairs the outrigger of his crude canoe. The outrigger helps to hold the craft upright.



**Gaily Dressed Samoan Dancing Girls** walk to the parade ground in Pago Pago, where a ceremonial dance is to be held.



**Picturesque Thatched Roofs** and roofs of corrugated iron offer a study in contrasts near the city of Apia, in Samoa. Houses

are built in simple fashion because the islands have a very mild climate. Plant life is particularly heavy.

Photos: Ewing Galloway; Gendreau; U.S. Marine Corps; Rathenau, Pix

## SAMPAN

used to watch reindeer, much as sheep dogs are used, and for pulling sleds. It is considered the oldest breed of domesticated dogs in the world. It is about twenty inches high at the shoulder and weighs between thirty-five and fifty pounds. Its hair is long and white, and its chest is deep and powerful. See also **DOG** (color plate, Working Dogs). S.E.M., JR.

**SAMPAN**, *SAM pan*, is a small light boat, which is chiefly used in the rivers and harbors of China, Japan, and near-by islands. The sampan usually has a cabin with a roof made of mats. Many natives use these boats for homes. The sampan is rowed with one or more oars, and some have a single sail. See also **CHINA** (illustration, Scenes from Everyday Life in China). A.L.A.

**SAMPLER**. The term *sampler* comes from the Latin word *exemplar*, meaning a *pattern*. Samplers were first made by adults to record patterns of embroidery or lace on cloth. But as early as the 1500's, little girls made samplers to learn fine needlework. Usually they embroidered patterns in colored silks on wool or linen canvas, or lace patterns on closely woven linen. Sometimes the name of the one who did the sewing, her age, the date the sampler was made, the letters of the alphabet, and numbers from one to ten were cross-stitched on the sampler. Many had Bible verses, poems, birds, flowers, houses, and even little men and women embroidered on them.

The shape and style of samplers varied from country to country and from century to century. Today they are collected by museums or private collectors. They show the needlework of little girls from England, America, Holland, France, Germany, Spain, Italy, and Scandinavia from the 1500's through the 1800's. J.F.E.



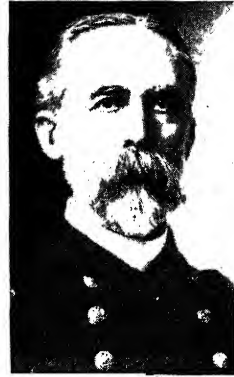
National Life Insurance Co.

**A Young Woman Embroiders a Sampler Held in a Frame.** Mottoes are particularly popular as sampler themes.

## SAMPSON

See also **COLONIAL LIFE IN AMERICA** (illustration, Arts and Crafts).

**SAMPSON, WILLIAM THOMAS** (1840-1902), was an American naval officer. He was noted for the part he played in the Battle of Santiago during the Spanish-American War.



Brown Bros.

**William Sampson** served in the U.S. Navy during two major conflicts.

Sampson was born in Palmyra, N.Y. He entered the United States Naval Academy at Annapolis in 1857 and was graduated at the head of his class four years later. Sampson served in the War between the States as executive officer of the *Palatka*.

Sampson later taught physics at the United States Naval Academy, and in 1874 was appointed head of the physics department there. He was appointed

Superintendent of the Academy in 1886. In 1893 he was made superintendent of the naval gun foundry at Washington and also Chief of the Bureau of Ordnance.

When the Spanish-American War broke out in 1898, Sampson was given command of the North Atlantic Squadron. The Spanish fleet was trying to enter a Cuban port and he was sent to stop them. But the Spaniards slipped into Santiago. Sampson then blockaded the port until the Spaniards were forced to leave. They tried to escape on July 3, 1898, but the American fleet destroyed them. Sampson was absent at a conference with General William Shafter, and Captain Winfield Scott Schley commanded the fleet in his absence. A bitter quarrel developed between the two officers as to who was really responsible for the victory. The dispute was never fully settled. C.L.L.

See also **SCHLEY, WINFIELD SCOTT; SHAFTER, WILLIAM RUFUS; SPANISH-AMERICAN WAR.**

**SAMPSON NAVAL CENTER.** See **SYRACUSE (N.Y.).**

**SAMPSON** was a popular hero of the ancient Hebrews. He was famous for his remarkable strength. The story of Sampson is told in the Old Testament, Judges 13-16.

According to the Bible, an angel commanded Sampson's mother to raise him as a Nazirite, or *consecrated one*. This meant that he must never drink wine, eat impure food, or cut his hair. When Sampson grew up, he fell in love with a Philistine woman. She was unfaithful to him and Sampson took revenge by setting fire to the fields and vineyards of her people. The Philistines captured Sampson. But Sampson broke his bonds and killed a thousand of his enemies with the jawbone of an ass.

Later Sampson visited a woman in the Philistine city of Gaza. The townspeople tried to capture him by locking the gates of the city. But Sampson tore out the gates and posts and carried them to a hilltop forty miles away.

Sampson's downfall came when he fell in love with another Philistine woman, Delilah. She coaxed from him the secret that his great strength lay in his uncut hair. Delilah was bribed by the Philistines to cut off

his hair while he slept. Then Samson was easily captured because he had only the strength of an ordinary man. The Philistines put out his eyes and imprisoned him in their temple.

During the great festival of the god Dagon, the Philistines came to gloat over Samson's defeat. He was led



Historical Pictures

**Samson Destroying the Temple of His Enemies** by pulling down two pillars which held up the roof. The avalanche of stone killed the giant Hebrew and three thousand Philistines.

from his cell so that all could see and mock him. But Samson's hair had grown long during his period of captivity and his strength had come back to him. He pulled down the two great pillars which supported the roof of the temple. The building collapsed, killing Samson and three thousand Philistines.

Many peoples have told tales about the adventures of a giant or strong man. Samson was the hero of the Hebrew stories, as Hercules was the strong man in Greek myths. But the stories of his great deeds are based on historical facts from the long struggle of the Hebrews against the Philistines in the 1000's B.C.

The life of Samson forms the basis of *Samson Agonistes*, a drama by John Milton (1608-1674). The story is also told in the opera *Samson and Delilah* by Camille Saint-Saëns (1835-1921), a French composer. W.A.I.

See also *DELILAH*; *GAZA*; *OPERA* (Some of the Famous Operas [Samson and Delilah]).

**SAMSUM.** See *TURKEY* (Cities).

**SAMUEL** was a Hebrew leader during the middle 1000's B.C. He was both a religious and a political figure, acting as a prophet, priest, judge, and ruler. The story of Samuel's life is told in the First Book of Samuel in the Old Testament.

According to the Bible, Samuel was born into a peasant family near Ramah in the south-central highlands of Israel. At an early age his mother, Hannah, took him to the shrine at Shiloh, where he was dedicated to the service of the Lord. He became not only a priest but a highly respected prophet as well. Some Biblical scholars believe that he organized and led the order of prophets which continued to be very important for many hundreds of years after him.

At this time the Hebrew tribes were ruled by judges.

But Samuel in his old age helped unite all the Israelites under a monarchy. He gave his blessing to Saul, who became first king of Israel. Samuel also chose David to succeed Saul, but he died before David became king. Samuel was a leader in the struggle of the Israelites against the Philistines.

The two Books of Samuel in the Old Testament sketch the history of the Hebrews from the birth of Samuel to the closing days of King David, that is, probably for more than a hundred years. They were not written by Samuel, but have taken his name because the stories about him are a prominent part of First Samuel. The books were put together from stories written by several different authors. An important part of them is the account of David's reign, which was written soon after his death by someone who had been important at his court. We do not know with certainty who he was, but at least he was a great historian. He wrote 500 years before the time of the Greek author Herodotus, who is called "The Father of History," by which some people mean to claim that he was the first man to write history. W.A.I.

**SAMURAI**, *SAM oo rye*, was the name given to the military class in early feudal Japan. The samurai were professional warriors.

The first samurai were military guards at the palace of the Mikado, or ruler. Later the term was sometimes used to describe the whole military system of Japan. This system included the *shogun*, or commander in chief, the *daimios*, or feudal nobles, and the *samurai* proper. The samurai proper were professional soldiers who fought under the daimios and enjoyed special privileges.

This feudal system was abolished in Japan in 1871. The daimios gave their lands back to the emperor and were given pensions for themselves and their samurai followers. The wearing of swords was forbidden. The samurai and daimios became the nobility of Japan. The samurai kept certain privileges. They had the right to commit suicide by *hara-kiri* rather than live to face dishonor. M.F.L.

See also *HARA-KIRI*; *NOGI*; *MARESUKE*; *SHOGUN*.

**SAN'A**, *sah NAH*, or **SANAA**. See *YEMEN*.

**SAN ANTONIO**, Tex. (population 253,854). In 1836 San Antonio became famous in United States history as the scene of the battle of the Alamo. Today, this modern city is known as the "Gateway to Mexico." It is an important shipping and industrial center, and the headquarters of a rich oil district. During World Wars I and II, San Antonio was one of the greatest military supply and training centers in the United States. It lies on the San Antonio River, about 150 miles north of the Gulf of Mexico.

**Cultural Life.** San Antonio is the home of Our Lady of the Lake College, San Antonio Junior College, Trinity University, and Incarnate Word College. There are many military and parochial schools in the city. The Mission Concepcion, Mission San Jose and Mission San Francisco are located here. Traces of the old city of Alamo days still remain, and the Alamo itself has been preserved for posterity. La Villita, a "Little Spanish Town," which was part of the early San Antonio, was restored in 1940.

**Industry and Trade.** San Antonio has four oil re-

## SANATORIUM

fineries and many oil-supply companies. Livestock and wool from the surrounding region are sent to the city's markets. San Antonio is the trading center for a large, fertile region that produces cotton, grain, forage crops, vegetables, and citrus fruits. Manufacturing plants in the city include flour mills, meat-packing establishments, breweries, ceramic works, and factories that make brooms, tile, refrigerators, and clothing.

**History.** The first permanent settlement, which was known as the Spanish Mission San Antonio de Valero, was made in 1718. For many years Spanish royalists and Mexican revolutionists struggled for control of the city, but a band of independent Americans fought for its freedom. On March 6, 1836, the famous siege of the Alamo took place and a group of defenders were killed by a Mexican army. Two months later the death of the heroes was avenged in the Battle of San Jacinto. San Antonio was freed from foreign rule when Texas became a republic. The city was a military center in the Mexican War and during the War between the States. Fort Clark, established in 1852, and Fort Sam Houston, established in 1865, are near San Antonio. S.A.MAGC.

See also ALAMO; TEXAS (History).

**SANATORIUM**, *SAN ah TOH ruh um*. See SANITARIUM.

**SAN BERNARDINO**, Calif. (population 43,646), is the chief trading center of a large mining and farming district. The city lies in southern California, about eighty-five miles east of Los Angeles. Many persons in the city are employed in the yards, shops, and offices of the Santa Fe Railway.

San Bernardino was part of the land grant of Rancho de San Bernardino in 1842. In 1851 a group of Mormons settled here and helped to lay out the townsite. Two years later San Bernardino County was established. San Bernardino became the county seat in 1854. P.R.H.

**SAN BERNARDINO MOUNTAINS**. See CALIFORNIA (Location, Size, and Surface Features).

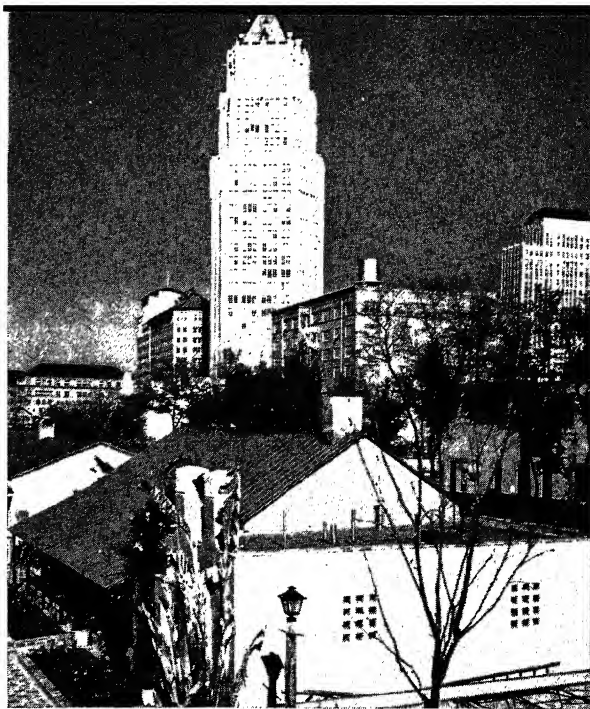
**SANCHO PANZA**, *SANG koh PAN zah*. See DON QUIXOTE.

**SANCTUARY, RIGHT OF**. See ASYLUM.

**SAND** is a material which consists of tiny loose grains of minerals or rocks that are no larger than  $\frac{1}{16}$  of an inch or smaller than  $\frac{1}{64}$  of an inch in diameter. Most sand grains are parts of solid rocks that have crumbled or worn away. Rocks crumble or wear away in many ways. Some rocks are made to crumble by the action of the air, rain, or frost. Rocks that are near large bodies of water are worn away by strong waves that roll over them and beat against them. The waves carry with them pebbles and particles of sand which chip and tear away small pieces of the rocks. Some sand is made up of particles of lava or melted rock that is blown from volcanoes. This type of sand is called *volcanic sand*.

Sand is widely distributed on the earth. It is found at the bottom of the sea and lakes where the waters are shallow. Sand is also being rolled along the bottom of rivers and may be spread by the rivers over the lowlands. Sand lies in great quantities on beaches and in sand dunes. In desert areas, sand covers thousands of square miles, piled up by the wind in rows after rows of sand dunes.

Sand is made up of many types of minerals. The most common mineral found in sand is *quartz*. Some sand is



Sawders, Combine

**Old and New San Antonio.** Modern skyscrapers tower above the low Spanish style houses of La Villita, a project which seeks to preserve buildings more than 100 years old.

made up almost entirely of quartz, but generally grains of many other minerals are present also. Other sand, such as that found on many beaches of the Pacific Islands, consists of grains of *basalt rock*. Basalt rock is a black lava which has flowed from or has been blown out of volcanoes on these islands. On other Pacific Island beaches, the sand is made up of tiny particles of corals and shells of clams and snails, broken up and rolled about by the waves.

There are many practical uses of sand. Quartz sand is used in the manufacture of glass and in certain chemical industries. Sand is most widely used in the making of mortar and concrete. Some river sands are rich in precious metals. W.H.Bu.

See illustration on following page; also SANDSTONE; SANDSTORM; SILICA.

**SAND**, *sand*, or (French) *sahnd*, **GEORGE** (1804-1876), was a famous French author. Her real name was Amandine Lucie Aurore Dupin Dudevant. She wrote under a man's name, wore men's clothes, and even smoked cigars. George Sand wrote about 110 books, but she is probably noted more for her colorful life and character than for her literary works.



Chicago Hist. Soc.

**George Sand**, French author who shocked Paris with her habits of living

George Sand was born in Paris, the daughter of an army officer. She was largely self-educated. At the age of eighteen she married Casimir Dudevant, a dull country gentleman.



## SOME USES OF SAND



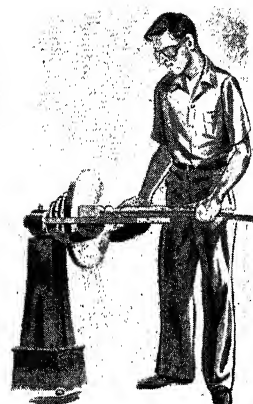
Sandblasting and Finishing Glass, Metal, Stone, and Other Materials



Glassmaking



Molds for Metal Casting



Abrasives



Mortar and Cement for Construction

Their marriage was very unhappy because of the differences in their tastes and intelligence, and after nine years she left him.

George Sand came to Paris and began to write for the newspaper *Figaro*. In Paris she met Jules Sandeau and fell in love with him. They lived together for several years and wrote novels together under the name of Jules Sand. When she wrote her first novel alone, she changed the pen name to George Sand.

In 1833 she met the poet Alfred de Musset. Her novel *She and He* tells of their short and stormy love affair. Her next lover was the ailing composer, Frédéric Chopin. She nursed him and cared for him for eight years, but their friendship was broken shortly before his early death. In 1848 she retired to her home in Nohant and lived there for the rest of her life.

**Her Works** include *Indiana*; *Lucrezia Floriani*; and *Maufrat*. Nearly all of her works express her unconventional ideas on morality, social organization, and government.

**SANDAL.** See DRESS (Dress of Ancient Times [Greece]); SHOE (Early Shoes).

**SANDALWOOD** is a scarce, valuable wood, which is obtained from several related kinds of trees. These trees grow in southern India, the East Indies, and Australia. The grain of sandalwood is fairly straight. The wood has a very fine structure and is so heavy that it will barely float in water. The center, or heartwood, has a yellowish-brown or orange color. Sandalwood has a fragrant

odor from an oil it contains. Most sandalwood is shipped to China, where it is used in funeral ceremonies, for carving, and for incense in temples. It is well suited to making carved boxes, jewel cases, fans, combs, and walking sticks. The oil is pressed out and used for perfumes, cosmetics, and medicines.

A.Ko.

**Classification.** Sandalwood is produced by several species of the botanical genus *Santalum*. The principal species is *album* of India.

**SANDBUR, or BURR GRASS**, is a troublesome prickly weed that originally came from the plains of the western United States. It now grows in sandy places in almost all temperate and tropical countries. The plant stem is between one and two feet high. It bears spikes with ten to twenty shiny, sharp-spined burrs, which cause painful wounds when they prick the flesh. A closely related species called the *cockspur* is common in the South.

F.Th.

**Classification.** There are several species of sandbur, all belonging to the genus *Cenchrus* in the grass family, *Gramineae*.

**SANDBURG, CARL** (1878- ), is an American poet and biographer. His poems are in rugged, Middle Western speech mixed with lyric passages. They are written in free, unrhymed verse and have often been compared to the poems of Walt Whitman.

Sandburg's book *Abraham Lincoln* is often considered the greatest biography of modern times. The work was



originally published in two parts, *The Prairie Years* and *The War Years*. Sandburg won the Pulitzer history prize in 1940 for *The War Years*. The biography fills six large volumes and took Sandburg twenty years of research and writing.



Schaal, Pix

**Carl Sandburg** won fame both as a poet and as a biographer.

Sandburg was born in Galesburg, Ill., the son of a Swedish blacksmith. He left school at thirteen and drifted from job to job. When the Spanish-American War broke out, Sandburg enlisted in the army. After leaving the army, Sandburg entered Lombard College in Galesburg where he began to write poetry. For a time he was a reporter on a Milwaukee, Wis., newspaper, and then went to Chicago. *Poetry*, *A Magazine of Verse* published his poems and he was encouraged to continue creative writing. Sandburg became an editorial writer on the *Chicago Daily News*. In 1915 he published *Chicago Poems* and from then on his fame was secure.

Sandburg is noted also as a collector of American folk songs and he frequently toured the country, giving recitals of his own poems and singing the little-known folk songs he collected. In 1927 he published *The American Songbag*, a collection of these songs with his comments. L.U.

See also PULITZER PRIZES.

**His Works** include *Smoke and Steel*; *Slabs of the Sun-burnt West*; *Good Morning, America*; and *The People, Yes*, as well as several volumes of stories for children.

**SAND CHERRY.** See BEACH PLUM.

**SAND DUNE.** See DESERT (illustration); DUNE; INDIANA (Physical Features).

**SANDEAU, SAHN DOH, JULES** (1811-1883). See SAND, GEORGE.

**SANDERLING** is a bird which belongs to the same family as the snipes and sandpipers. It differs from these birds by having only three toes. Sanderlings breed on beaches and tundra in the Arctic regions, and travel south in the winter. They are seen in winter from California and Texas to South America and on a number of Pacific Islands.

The bird is about eight inches long. Its feathers are hoary gray on the upper parts, and pure white beneath. It is a true beach bird and usually is found on shores washed by the sea. Its favorite foods are small shellfish and marine insects which wash up with the tide. The female lays three or four eggs colored a brownish olive and speckled with darker markings. The eggs are laid in a tuft of weeds or in a little hollow in the earth lined with dry grass. A.M.B.A.

**Classification.** The sanderling belongs to the family *Scelopacidae*. Its scientific name is *Crocethia alba*.

**SAND FLY.** The sand flies are tiny insects that suck blood, as do their relatives, the gnats and mosquitoes. Some types of sand flies are the midges that fly around in great swarms. They can be very annoying in spring and fall.

One group of sand flies is among the smallest blood-sucking insects. Some are only  $\frac{1}{25}$  inch long. They have two wings that lie flat on the back when the insect is at rest. The larvae of these flies are like tiny, soft worms. They usually live in the water, but some live under bark and leaves, or in the sap flowing from breaks in trees.

The sand flies of another group are hairy, dark brown insects about  $\frac{1}{8}$  inch long. They look like moths, and are also called moth flies. Most of these flies have wings that fold over the body like a roof. The larvae live in sink drains, cesspools, manure, and decaying matter. The adults fly out of the drains at night. In the United States there is only one kind of sand fly that sucks blood, but there are several in the tropics and subtropics. They are dangerous to man because they carry diseases. Among these are fevers, and verruga peruana, which brings on skin ulcers. E.W.T.

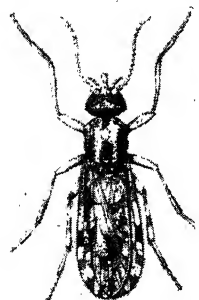
See also DIPTERA.

**Classification.** Sand flies belong to the order *Diptera*. The tiny biting midges are of the family *Ceratopogonidae*, and the genus *Culicoides*. The mothlike flies belong to the family *Psychodidae*. The single biter of this family in the United States is *Phlebotomus vexator*.

**SANDGLASS, or HOURGLASS.** See HOURGLASS.

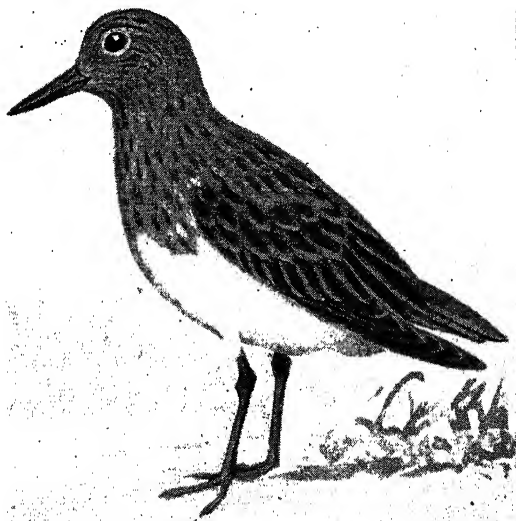
**SANDHAM, HENRY** (1842-1910), was a Canadian painter and illustrator. He was noted for his landscapes and his pictures of everyday life.

Sandham was born in Montreal, Canada, the son of a house painter. He taught himself to paint while



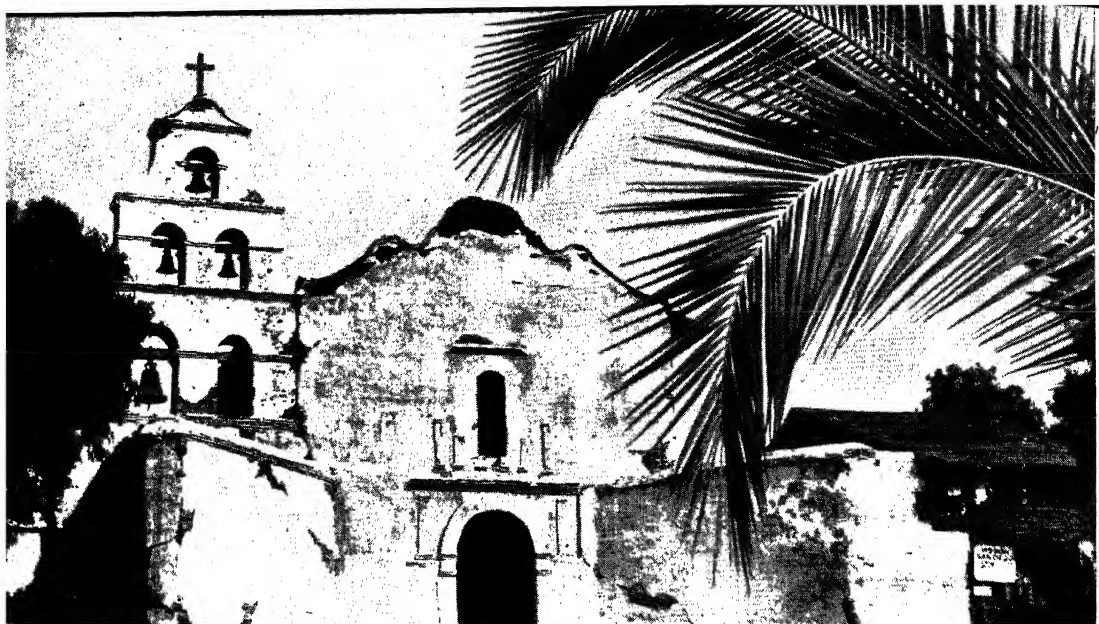
U.S.D.A.

**The Salt Marsh Sand Fly** is a very tiny, biting midge.



K.P.

**The Sanderling** leaves the Arctic to spend its winters in the warmer regions of America. It wheels and swoops along the seashore, looking for its favorite food.



**Historic Old Mission of San Diego de Alcalá on the Outskirts of San Diego, Calif., Was Built in 1769**

San Diego-California Club

working with his father. Later he received some instruction from Otto Jacobi and other Canadian painters. In the 1880's he opened a studio in Boston and drew illustrations for American magazines. He went to England in 1901 and opened a studio in London, where he remained for the rest of his life.

M.C.C.

**His Works** include "Fog in Saint John's Harbor"; "Hunters Returning With Their Spoils"; and "The Battle of Lexington."

**SANDHILL CRANE.** See BIRD (color plate, Bird Courtship); CRANE.

**SAN DIEGO, Calif.** (population 203,341), is probably best known as the home port of the Eleventh Naval District. San Diego's natural, landlocked harbor is always crowded with navy vessels, passenger and freight steamships, and fleets of fishing boats.

San Diego lies in the extreme southwestern corner of the United States, only sixteen miles from the Mexican boundary. The city was the oldest Spanish settlement in California, and many reminders of Spanish days remain.

The United States Naval Training Station, the United States Marine Corps Base, and the San Diego Coast Guard Air Station are located in or near the city. At the southern end of San Diego Bay is the United States Navy Destroyer Base.

Balboa Park, covering 1,400 acres, was the site of the Panama-California Exposition in 1915 and 1916, and the California Pacific International Exposition in 1935 and 1936. The San Diego Zoological Gardens is one of the largest zoos in the United States. World-famous vacation resorts near San Diego include La Jolla, Delmar, and Coronado. At La Jolla is the Scripps Institution of Oceanography, a branch of the University of California.

Educational institutions in the city include San Diego State College, Brown Military Academy, Bishop's School for Girls, Balboa Law College, and several aviation schools.

**Industry and Trade.** San Diego has more than 500 manufacturing industries. The chief activity is the manufacture of airplanes and parts. The canning of the various fish and other seafoods brought to the harbor by the Pacific fishing fleets is the second most important industry of the city. Other products of San Diego factories include ships and boats, onyx and marble novelties, and packaged and canned foodstuffs, especially salt, olives, and pimientos.

**History.** The site of San Diego was visited by Father Marcos in 1539 as he searched for the Seven Cities of Cibola. The region was later visited by two other Spanish explorers, Cabrillo in 1542, and Vizcaino in 1602. In 1769 Governor Portola and Father Serra established the San Diego de Alcalá, the first mission in California. San Diego became a center for trading in cattle hides, and was organized as a pueblo (Spanish town), in 1834. This first settlement, which was called Old Town, stood west of the mission, and is a part of the present city. The United States flag was first raised in California when Fort Stockton was established in 1846. San Diego was incorporated as a city in 1872. The growth of the modern city began in 1885, when the tracks of the Santa Fe Railway reached the city. P.R.H.

**SAN DIEGO COAST GUARD AIR STATION.** See SAN DIEGO.

**SAN DIEGO NAVAL AIR STATION AND TRAINING AND DISTRIBUTING CENTER.** The United States Navy's largest air station on the West Coast is located on North Island in San Diego Bay, Calif. The station was established in 1917. It usually has about 1,000 officers and about 15,000 enlisted men and women. During World War II, 31,400 pilots, navigators, gunners, and bombardiers were trained at the station. The station is headquarters for the Naval Air and Fleet Commanders of the Eleventh Naval District.

**The Naval Training and Distribution Center,** called Camp Elliott, is sixteen miles northeast of San Diego, Calif. The center was established June 26, 1944, and

covers 28,740 acres. It is an advance training center, and has quartermaster, chemical warfare, and amphibious training schools.

R.COL.

**SAN DIEGO STATE COLLEGE** is a state-supported co-educational school in San Diego, Calif. Courses are offered in the liberal arts with special emphasis on teacher training. Out-of-town students live in dormitories and rooming houses. The college was founded in 1897 and has an average enrollment of about 2,000.

W.R.H.

**SAND MARTIN**, or **BANK SWALLOW**. See **SWALLOW**.

**SAN DOMINGO**, a variant of **SANTO DOMINGO**. See **DOMINICAN REPUBLIC**.

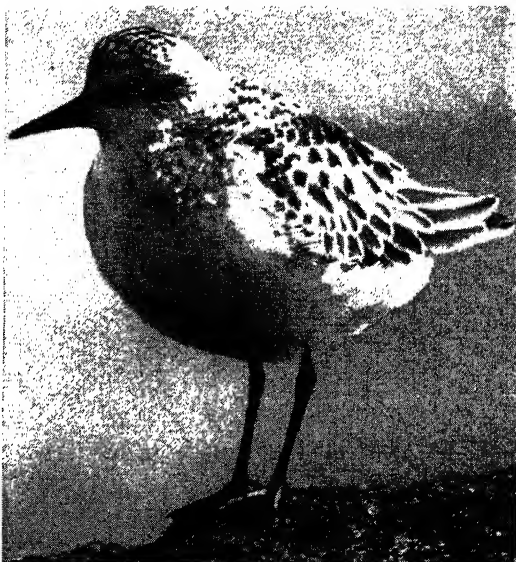
**SANDOW**, *SAN doh*, **EUGENE** (1867-1925), was a German strong man. He traveled widely in Europe and the United States, performing great feats of strength. Sandow's fame helped to make physical-culture magazines and correspondence courses in body building popular in the United States. Sandow was born in Königsberg. As a child he was weak and sickly, but he determined that one day he would have a strong body. So he studied anatomy and built up his muscles by scientific methods. Later in life Sandow became a British subject and helped train British soldiers during World War I.

E.W.N.

**SANDPIPER**. A large number of birds are sometimes called sandpipers. But the name is usually given to small birds with long, sensitive bills. These birds live on the seashore in all parts of the world, and some

species build their nests north of the Arctic Circle.

Their plumage varies from buff to brown, gray, white, or black. The birds dig in the soft mud or sand for insects, worms, shrimps, and soft mollusks. They often follow receding waves, sometimes alone, sometimes in flocks, searching for bits of food. Their graceful



Cruikshank, Nature Magazine

**The Semipalmated Sandpiper** is one of the smallest of the shore birds. It is frequently called the black-legged peep.

movements and cheerful cries have made them favorite birds of many people. The female sandpiper lays three or four eggs colored a light gray, buff, or olive, and spotted with dark brown.

One of the best-known American species is the *spotted sandpiper*, which is found throughout the United States and southern Canada. The *Bartramian sandpiper*, also called the *upland plover*, is a useful bird that eats insects. It lives on dry uplands in the United States and Canada. It was once killed in great numbers. A larger species called the *willet* lives in marshes along the warm Atlantic and Gulf coasts, and in many western states. There are many other kinds, closely related in appearance and habits. All are protected from hunters by the Federal Government.

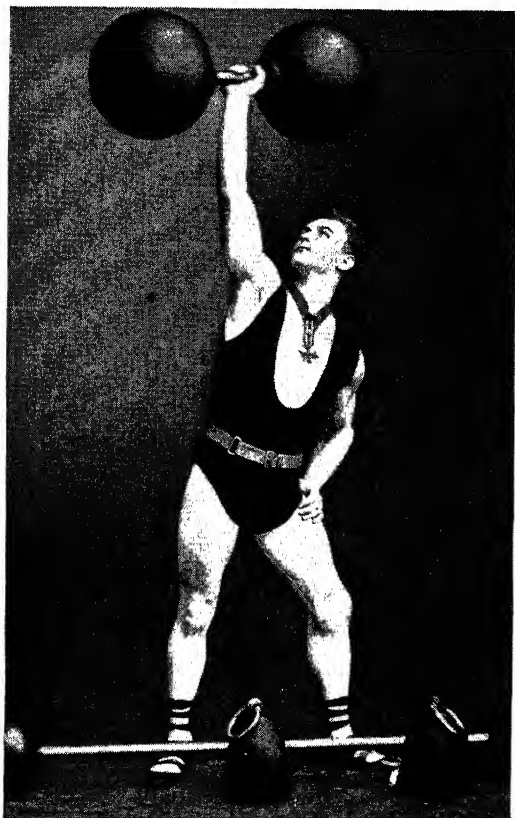
A.M.B.A.

See also **AVOCET**; **RUFF**; **WILLET**.

**Classification.** Sandpipers belong to the *Scolopacidae* family. The spotted is *Actitis macularia*, the Bartramian is *Bartramia longicauda*, and the willet is *Catoptrophorus semipalmatus*.

**SANDSTONE** is a kind of rock made of grains of sand naturally cemented together. The cementing substance is some mineral, usually silica or carbonate of lime. Sandstones have different colors, from white to dark gray or brown. Varieties in which silica forms the cement look glassy. In some places, this variety of sandstone is quarried and used in manufacturing glass.

Before the time of Portland cement and reinforced concrete, sandstone was widely used for large buildings. Some of the finest cathedrals of Europe are built of sandstone. "Brownstone" houses built of a reddish-brown va-



Brown Bros.

**Eugene Sandow Lifting 250 Pounds** with one arm. It is difficult to believe that this muscular giant was puny and sickly as a child. His muscles earned him a fortune.

riety of sandstone were once popular in the eastern United States. This type of sandstone is still an important building stone. W.H.Bu.

See also BUILDING STONE; QUARRYING.

**SANDSTORM.** A sandstorm is a strong wind that carries clouds of sand or dust along with it. Sandstorms usually rise from the heat of the sun beating on broad deserts or plains. The rapid daytime heating of the lower air over deserts makes the heated air rise, to be quickly replaced by the cooler air. The resultant wind may be strong and constant or intermittent and turbulent. A trip in the desert is often a steady struggle against wind and blowing sand. Desert wind is often clouded with fine dust which fills the eyes, nose, and throat. Much of the dust is carried beyond the desert border to form rich soil deposits in near-by regions. Heavy rock particles hurled about in sandstorms are one of the tools used by the wind to form sand dunes and carve rocky surfaces, thus changing the form of the earth.

The *sirocco* is a hot, steady wind often heavily laden with dust, which blows north over the Mediterranean from the Sahara each spring. The *simoom* is a hot, dry, violent wind carrying sand which blows from the deserts of Arabia and Syria. In India these storm winds are called *peesash*, from the Hindu, or *shaitan*, from the Arabic name for devil. E.S.S.

See also DESERT; SIMOOM; SIROCCO.

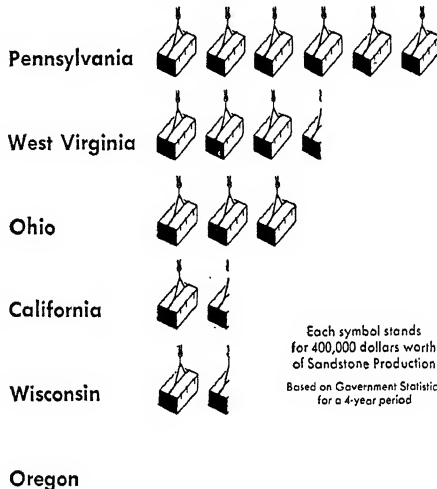
**SANDUSKY, Ohio** (population 24,874). This industrial city leads the world in the manufacture of school crayons. Sandusky also ships more coal than any other city on the Great Lakes except Toledo. The city lies on Sandusky Bay, about fifty-five miles southeast of Toledo. It is the trading center for a rich orchard and rock-quarrying region. Paper mills and iron foundries are other principal industrial plants of the city. W.R.McC.

**SAND VERBENA.** Sand verbenas are low herbs with fragrant pink, white, or yellow flowers. They are native to western North America. The best-known type of sand verbenas is nine inches tall and has pink flowers. These plants like to grow best in sunny places, and will bloom all summer. The seeds should have their husks removed before they are sown. They can be planted in pots in the fall, or outside in spring when it is too late for frost. Some sand verbenas are used in borders or flower gardens, rock gardens, vases, and baskets. They have a pleasant fragrance in the evening. A.C.Ho.

**Classification.** The sand verbenas make up the genus *Abronia* in the family *Nyctaginaceae*. The best-known species is *A. umbellata*.

**SANDWICH ISLANDS.** See HAWAIIAN ISLANDS.

### Six Leading Sandstone States



**SANDY HOOK** is a low, sandy point of land reaching north from the New Jersey coast into New York Bay. Sandy Hook Bay is on the west of the peninsula, and the Atlantic Ocean lies to the east. The sandy waste is covered with poison ivy, huge holly trees, and beach-plum bushes. The Hook is eighteen miles south of Manhattan Island. It is six miles long, and a mile wide at its widest point.

Fort Hancock, which is an important part of the defenses of New York Harbor, is on the farthest tip of

Sandy Hook. Part of the peninsula is used by the United States Government as a testing ground for heavy guns. The tip of the Hook is guarded by a beacon, but the first light seen by incoming ships comes from a ninety-foot lighthouse about a mile from the tip. This lighthouse, built in 1763, is the oldest in service in the Western Hemisphere. E.L.Thu.

**SAN FRANCISCO, Calif.** (population 634,536). The rugged beauty of its setting on the largest landlocked harbor in the world and a stormy history make San Francisco one of the most dramatic of cities. Seven times within the last hundred years San Francisco

has burned to the ground. These great fires, together with huge immigrations, earthquakes, water-front strikes, and the part the city has played in wars, have shaped the character of the city. More than any other metropolis, San Francisco is symbolic of America's vigor. Today its people are tolerant, cosmopolitan, and hardy.

The charm of its water front, its famous restaurants, and colorful history has made San Francisco the great "story city" of America. Mark Twain, Jack London, Robert Louis Stevenson, Bret Harte, Richard Henry Dana, and many others have used San Francisco as a setting for stories.

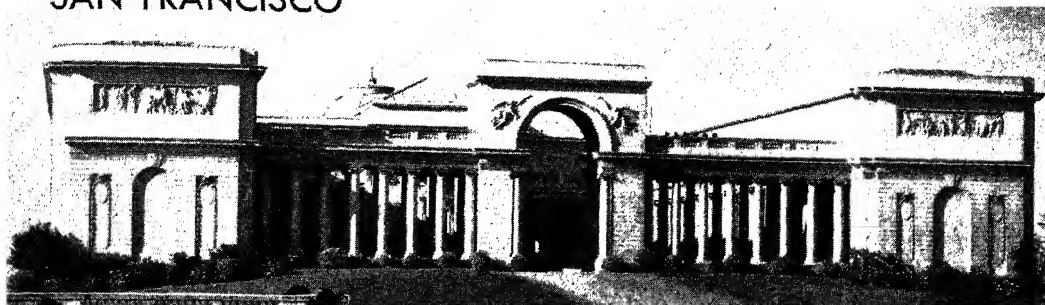
### Location, Size, and Description

The city by the Golden Gate, which is the famous mile-wide entrance to the harbor, is 907 miles south of Seattle, and 468 miles northwest of Los Angeles. It is about 3,170 miles west and south of New York City.

San Francisco lies near 38° North latitude. This is about as far north as Washington, D.C.; Athens, Greece; and Tokyo, Japan.

The Pacific Ocean faces San Francisco on the west. To the east and north is the great San Francisco Bay, a body of water measuring 450 square miles. It is spotted with famous islands. There is grim Alcatraz, site of the Federal prison; Angel Island, an immigration station; Mare Island, home of the great naval base; Yerba Buena; and man-made Treasure Island, on which the Golden Gate International Exposition was held in 1939

# SAN FRANCISCO

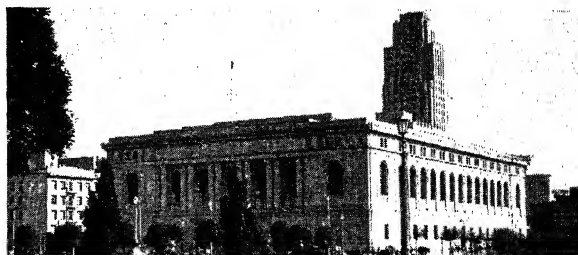


**The Stately California Palace of the Legion of Honor** is a memorial to the war dead of the city and state. The struc-

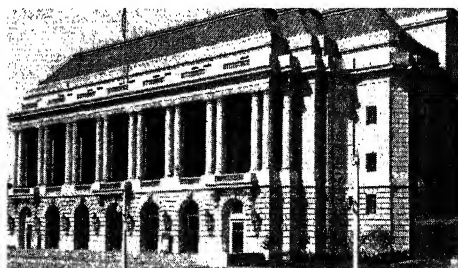
ture has nineteen galleries, containing permanent and loan collections of paintings and other works of art.



**The Mission Dolores**, in the left foreground, was founded the same year as the Republic—1776.



**The Public Library** of the city and county of San Francisco is part of the city's vast and imposing Civic Center.



**The Civic Opera House** was the scene of the major sessions during the formation of the United Nations organization.



**San Francisco and the Golden Gate** offer a magnificent scene from the popular cafe at the top of the Mark Hopkins

Hotel. In the distance the great single span of the Golden Gate bridge connects the city with the redwood country.

Photos: Ewing Galloway; Owen, Black Stu



## SAN FRANCISCO

and 1940. The rugged Farallon Islands lie thirty-two miles off shore. Here Coast Guard men keep constant watch to keep ships from crashing on the jagged rocks.

San Francisco ranks as the twelfth city of the United States in population, but its area is only forty-four square miles. Buildings cling to the sides of the steep hills at the top of the peninsula on which the city lies. Downtown skyscrapers and warehouses rest on the artificial land built over the beached ships and wharves of the gold rush period of the 1850's.

Market Street is the main retail business street of the city. It stretches diagonally across the peninsula from the Embarcadero, the waterfront of San Francisco, to Twin Peaks. This bold hill, with its two peaks, is the geographic center of the city.

The steepest streets in the world leave Market Street to climb Nob, Russian, and Telegraph hills. Cable cars, a distinctive feature of San Francisco, are needed to climb the grades. About halfway inland along Market Street is the Civic Center. Here are the City Hall, the Public Library, the Civic Auditorium, and the State Building. San Francisco probably has more hotels and restaurants than any other city in the world.

The suburbs of the city include Palo Alto, the home of Stanford University, thirty miles to the south. Across the Bay to the east are the cities of Oakland, Berkeley, Alameda, and Richmond. Directly north, across the Golden Gate, is the little town of Sausalito, which is the home of artists and fishermen.

### The People

The first settlers at the site of San Francisco were Spanish soldiers and priests who accidentally discovered the Bay on a 500-mile march from San Diego. They were followed by American traders sailing out of Boston, Russians from Alaska, and pioneers who came overland in covered wagons. The gold rush of 1849 brought people from every country in the world to San Francisco. Today only New York City and Philadelphia have more people to the square mile than San Francisco.

**Foreign Colonies.** One out of every six persons in San Francisco is foreign-born. People of thirty nations are



**The Musical Instruments of Old China** are used regularly in San Francisco's Chinatown — largest Chinese settlement in the United States. An organization has been formed to preserve the ancient music and instruments.

## SAN FRANCISCO

well represented in San Francisco. There are many colorful foreign districts.

Among the foreign colonies of the city, Chinatown holds the greatest appeal for most tourists. Chinatown leads up from Grand Avenue, with its world-famous exclusive shops and stores, and occupies the section bounded by Kearny and Stockton streets and California and Pacific streets. Practically no white persons live in this area of ten city blocks. Here the customs, ceremonies, and practices of the Chinese residents prevail, except for slight regulations set up by the United States Government. Chinatown was destroyed by the great fire in 1906, and the old buildings have been replaced by modern structures. The chief interest is in the people, for here one may see China without crossing the ocean. Here, too, one may find a Chinese telephone exchange, with Chinese girls operating the switchboard. Other interesting places include the Latin Quarter, which is reached by Columbus Avenue; the Spanish and Mexican districts, on Powell Street; and the Japanese and Greek settlements.

### Cultural Life

San Francisco has more than 180 public schools. The city is the home of the University of San Francisco and the San Francisco State Teachers' College. Many Roman Catholic parochial schools are a reminder that Franciscan fathers were the earliest teachers in the city.

The main public library is located in the Civic Center. Branch libraries are maintained in every community. The entire library system has more than 550,000 volumes. In addition to the public libraries there are more than a hundred private and special libraries.

San Francisco has 340 churches that represent many religious faiths. Numerous societies, clubs, and lodges are a part of the city life.

**Recreation.** San Francisco has fifty-three parks, and ninety-four recreational units, including the great outdoor Fleishacker swimming pool. There are three miles of white sand beach where bathers can enjoy the Pacific surf. Golden Gate Park is noted for its beautiful flowers, lakes, lawns, and bridle paths.

One of the most interesting places to visit in San Francisco is the Presidio. It was once the garrison of Spanish soldiers and is now the largest military reservation of the United States Army. The Presidio covers 1,542 acres. One long, low adobe structure, once the headquarters of the Spanish commandant, was built in 1776, and is believed to be the oldest building standing in San Francisco. It is now a club for officers. Other public institutions which interest visitors include the Steinhart Aquarium, the Zoo, the De Young Museum, and the California Palace of the Legion of Honor.

### Industry and Trade

About fifty large industries are centered around San Francisco, but they are all less important than the city's shipping. Steamship lines operate to and from every deep-water port in the world. The produce of eleven Western states, including fruit, grain, minerals and oil, moves from San Francisco in ships. This trade has made San Francisco the financial and marine insurance capital of the West.

**Transportation.** Transcontinental air, rail, and high-



Screen Traveler, Gondreau

**A Housewife Inspects a Succulent Crab** at Fisherman's Wharf, famed for delicious sea food. The market is not only a

great wholesale and retail center of San Francisco, but also has many excellent restaurants serving sea-food dishes.

way facilities enter the Bay area from all parts of the nation. Four Class 1 railways, many bus and truck lines, and innumerable coastwise and foreign vessels make San Francisco a terminal.

The city has no subways, but distances are fairly short. Buses, streetcars, and the colorful cable cars provide transportation for people who work in the city.

**Bridges.** Highway traffic across the southern end of San Francisco Bay has been speeded up by the building of a seven-mile concrete bridge extending from the foot of Third Avenue, in San Mateo, to Mount Eden, on the Alameda side, near Hayward. This is a toll bridge, and motor traffic can use it.

The San Francisco-Oakland Bay Bridge is a giant structure between San Francisco and Oakland. The total length of the bridge is eight and one quarter miles. It is the longest bridge in the world over navigable water. The bridge extends from Rincon Hill in San Francisco over the West Channel of San Francisco Bay to Yerba Buena Island, then over the East Channel to Oakland.

Another great project was the construction of the Golden Gate bridge. This bridge, completed in 1937 provides direct connection between San Francisco and the Redwood Empire, giving the West Coast an unbroken driveway from Seattle to San Diego.

#### Government

The government of San Francisco is made up of two branches. The legislative branch is made up of a board of supervisors. The administrative branch is presided over by the mayor.

San Francisco is the site of the United States Circuit

Court of Appeals for the Ninth Judicial Circuit. This court holds a wider jurisdiction than any similar court in the United States.

#### History

In 1769 Don Gaspar de Portolá, a rugged soldier of Spain and newly appointed governor of California, first glimpsed San Francisco Bay. This was a surprising discovery, since explorers and navigators had been missing the harbor for two hundred years. De Portolá's party, exploring overland, saw the Bay from near-by hills. In 1775 the little caravel *San Carlos* came to anchor in the Bay. This was the first vessel to pass through the Golden Gate.

British exploration ships, Russian vessels, and enterprising trading craft out of New England ports helped build the lonely settlement that at first was held by native Indians and Spanish priests and soldiers. The first church, the Spanish Mission Dolores, was begun in 1776. It is still standing. In 1847 only 850 persons lived on the shores of the Bay. In the next year gold was discovered by a settler, James Wilson Marshall, just inland from San Francisco. Then the adventurers of the world headed for the Golden Gate. They arrived in all types of vessels, including Chinese junks, brigs, barks, full-rigged ships, and even in river boats from the Mississippi and Hudson rivers. Many walked overland, or rode battered covered wagons. Hundreds of thousands of people crowded San Francisco.

Later more people came with the famous clipper ships and the first transcontinental railroad. Fires, famine, riots, and political turmoil followed this unnatural immigration of people. The "Vigilantes," a group formed by men who took the law into their own

hands, was the only effort to preserve order and decency. The Barbary Coast became known throughout the world as an evil place where sailors were "shanghaied," or kidnapped and forced to serve aboard ships.

In 1900 San Francisco was a young and vigorous city. It had burned down many times, and had been rebuilt in unplanned fashion. In 1906, a great earthquake and a fire that followed killed 452 persons and destroyed 28,000 buildings. This time San Francisco was rebuilt as a new and greater city.

During World War II San Francisco probably played a greater role in the Pacific war than any other city of the United States. It became the world's largest ship-building center and the site of the largest base of the United States Navy. Thousands of men in all branches of the armed services were stationed in or near the city, manning such installations as Fort McDowell, Fort Mason, Fort Winfield Scott, Letterman General Hospital, the South San Francisco Coast Guard Air Station, the Alameda Coast Guard Training Station, and the San Mateo Merchant Marine Cadet Basic School.

Today San Francisco shows few scars of its stormy history. It is, as Will Irwin wrote: "a bonny, merry city—a good gray city."

F.R., JR.

**Related Subjects.** The reader is also referred to:

Alcatraz	San Francisco-Oakland
Golden Gate	Bay Bridge
Golden Gate Bridge	San Francisco State
Gold Rush	College
Marshall, James	San Francisco Training
San Francisco, University of	and Distribution
San Francisco College	Center
for Women	

#### Questions

How does San Francisco rank in size among cities of the United States?

What is each of the following, and why is it noted:

- (a) Golden Gate? (b) Alcatraz? (c) Market Street? (d) Embarcadero? (e) Presidio?

Why are cable cars used in the city?

Who first settled this area? What event rapidly increased San Francisco's size?

What is the city's greatest industry?

How has traffic been speeded up between San Francisco and neighboring areas?

Who first discovered San Francisco Bay? When?

**SAN FRANCISCO, UNIVERSITY OF**, is a privately controlled school in San Francisco, Calif. It is conducted by the Jesuits. Day instruction in the liberal arts and the school of business administration is open to men only. Both men and women may attend the school of law, liberal arts, and business administration in the evening division, the extension division, and the summer school. The school was chartered as St. Ignatius College in 1859 and given its present name in 1930. It has an average enrollment of about 1,100.

**SAN FRANCISCO COLLEGE FOR WOMEN** is a women's school in San Francisco, Calif. It is controlled by the Catholic Church. Courses are offered in the liberal arts, sciences, and nursing education. The college was founded in 1922 and has an average enrollment of about 500.

MTHR. I. M.

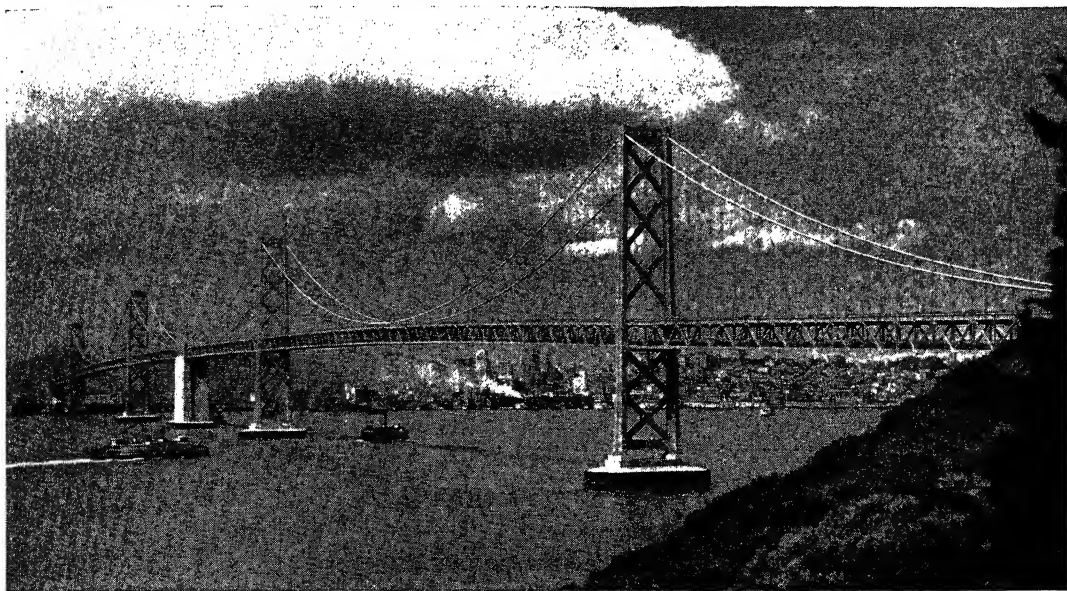
**SAN FRANCISCO CONFERENCE.** As World War II drew to a close, the leaders of the United Nations began to plan for a world organization which would be strong enough to prevent another war. A conference of all the United Nations was planned. The delegates to this conference were to draw up a charter, or constitution, for the United Nations. San Francisco was chosen as the place for the United Nations conference. The delegates assembled there on April 25, 1945.

The San Francisco Conference was sponsored by four countries, the United States, Great Britain, the Soviet Union, and China. A total of fifty nations sent delegates



**Delegates from Forty-Six Nations** take part in the opening ceremonies of the conference of the United Nations, held in

San Francisco in 1945. The meeting was devoted to drawing up a charter, or constitution, for the organization.



California Dept. of Public Works

**The Graceful Tracery** of the San Francisco-Oakland Bay Bridge rises over the great Pacific Coast harbor. This photo-

graph of one of the two spans of the bridge was made from Yerba Buena Island. Each span is more than 2,000 feet long.

to San Francisco. Delegates from forty-six of these nations were present at the opening. Argentina, Denmark, and the two Soviet Republics of Byelorussia and the Ukraine were admitted later.

The United Nations Charter was completed after two months of work. This document became the constitution of the United Nations. It provided:

A *General Assembly* of all the member nations. Each nation has one vote in this assembly. The assembly decides the policies of the United Nations.

A *Security Council* of eleven member countries. The United States, Great Britain, the Soviet Union, China, and France are permanent members of the Security Council. It is the duty of this council to take action to prevent or to stop wars anywhere in the world.

An *Economic and Social Council* made up of delegates from eighteen countries. Its purpose is to promote the freedom and well-being of all peoples throughout the world.

A *Trusteeship Council* which advises on the government of various colonial peoples.

An *International Council of Justice* which settles legal disputes between the member countries.

A *Secretariat* to do the day-by-day work. This staff is directed by a Secretary General.

This charter was finally found satisfactory by all the assembled delegates of the fifty countries. The delegates signed the charter on June 26, 1945. As evidence of its sincerity each nation promised to:

Fulfill its obligation under the charter.

Settle disputes by peaceful means.

Neither use nor threaten force in its dealings with other nations.

Co-operate in police action to prevent or stop war.

Give no help to any aggressor nation.

Co-operate in the solution of economic, social, and other problems.

The charter drawn up at the San Francisco Conference gave the world a new hope for the future. At the closing session of the San Francisco Conference, Presi-

dent Harry S. Truman said, "If we had had this Charter a few years ago, and above all the will to use it, millions now dead would be alive. If we should falter in our will to use it, millions now living will surely die." P.S.W., JR.

See also DUMBARTON OAKS; UNITED NATIONS.

**SAN FRANCISCO MOUNTAIN.** See ARIZONA (Location, Size, and Surface Features).

**SAN FRANCISCO-OAKLAND BAY BRIDGE.** This is the longest bridge in the world over navigable water. It crosses San Francisco Bay between the cities of Oakland and San Francisco, Calif. The Bay Bridge is really a series of bridges. It is more than eight miles long, including its two approaches. It carries two decks for traffic. The bridge cost \$77,200,000, which is the largest amount ever spent on a bridge project. Twenty-four men lost their lives during the building of the bridge.

One part of the Bay Bridge consisting of two suspension bridges reaches from San Francisco to Yerba Buena Island in the bay. From the other side of this island the bridge continues at an angle to Oakland and Berkeley. On Yerba Buena the roadway passes through a double-deck, 500-foot tunnel, one of the largest-bore tunnels in the world.

The upper deck of the Bay Bridge has six traffic lanes for automobiles. The lower deck has three lanes for trucks, and two interurban tracks.

Halfway between San Francisco and Yerba Buena the suspension spans are anchored to a concrete anchorage pier. The spans themselves are carried by suspension cables supported by towers extending 505 feet above the water. The two center spans on each side of the anchorage pier are 2,310 feet long.

The bridge is lighted at night by yellow sodium-vapor lights which improve visibility for driving in fog. The California Toll Bridge Authority and the State Department of Public Works planned and built the bridge. It was opened in 1937.

A.B.L.

**SAN FRANCISCO STATE COLLEGE** is a publicly controlled coeducational school in San Francisco, Calif. Courses are offered in teacher training, nursing, business, social service, speech arts, journalism, and the liberal arts. The college was founded in 1899 and has an average enrollment of about 1,900. P.F.V.

**SAN FRANCISCO TRAINING AND DISTRIBUTION CENTER.** This training center of the United States Navy is on the island of Yerba Buena in San Francisco Bay, California. The center covers 107.3 acres, and has complete facilities for training navy apprentices. During World War II the training center also had facilities on Treasure Island and barracks on Market Street in San Francisco. Sailors were trained here in groups of 40,000 during the war. The training center was established on Yerba Buena in 1896. R.COL.

**SAN GABRIEL DAM** is the name of two flood control projects on the San Gabriel River in southern California. Both dams were built by the Los Angeles County Flood Control District.

*San Gabriel Dam No. 1* is the largest and highest rock-fill and rolled-earth dam in the United States. It is 377 feet high, and has a crest length of 1,500 feet. The reservoir had an original capacity of 86,062,000 cubic yards of water. The dam was completed in July, 1939, at a cost of \$17,001,132.

*San Gabriel Dam No. 2* is a smaller, rock-fill structure, 280 feet high and 585 feet long. Its reservoir originally stored 19,841,000 cubic yards of water. This dam was completed in April, 1934, at a cost of \$3,127,762.

See also DAM.

**SANGER, MARGARET** (1883- ), became the leader of the birth-control movement in America. She was the founder and president of the American Birth Control League. Margaret Sanger was born in Corning, N.Y. Her mother died of tuberculosis and the daughter caught this disease while nursing her. But she fought her way back to health and took nurse's training at the White Plains (N.Y.) Hospital.



Aeme

**Margaret Sanger** devoted her life to promoting planned parenthood.

Later she worked as a nurse among the poor of New York City. Her experiences convinced her of the need for planned parenthood, or birth control. She began to write pamphlets explaining methods of birth control, and circulated them among the poor. Margaret Sanger was arrested many times for her work, but finally met some success. Laws were passed in many states which permitted doctors to advise patients about birth control for the purpose of the "cure or prevention of disease," and laws against birth control in some other states were less strictly enforced as a result of her efforts. R.M.B.

**SANGSTER, CHARLES** (1822-1893), was a Canadian poet. He started writing patriotic verses in about 1860 at a time when political conditions in Canada were at

their worst. His poems helped arouse national feeling in favor of confederation, or union, of the provinces of Canada. Sangster was born in Kingston, Ontario, and became a newspaper editor at Amherstburg. In 1868 he received an appointment in the Post Office Department. W.S.W.

**His Works** include *The Saint Lawrence and The Saguenay*, and *Other Poems* and *Hesperus and Other Poems and Lyrics*.

**SANHEDRIN**, *SAN hee drin*, was the highest national governing council of the Jews in Roman times. According to some scholars, there were two Sanhedrins. The twenty-three members of the political and civil Sanhedrin came mostly from among the Sadducees. The seventy members of the religious Sanhedrin, which was presided over by the high priest, were chosen largely from among the Pharisees. Jesus was tried before the religious Sanhedrin. Peter, John, Stephen, and Paul appeared before it on charges of religious error. After the fall of Jerusalem in A.D. 70, the council declined and finally completely disappeared. See also GAMALIEL. L.L.M.

**SANITARIUM**, *SAN ih TAIR ih um*, is a place to which people go to improve their health. The word comes from the Latin word for health, *sanitas*. It is sometimes used as another word for, or the equivalent of, *sanatorium*.

The term *sanatorium* is used for an establishment where sick people are treated. It is especially used for a place where a particular treatment is given, or one kind of disease is treated. In English usage a sanatorium is a health resort, or locality of favorable climate. T.P.

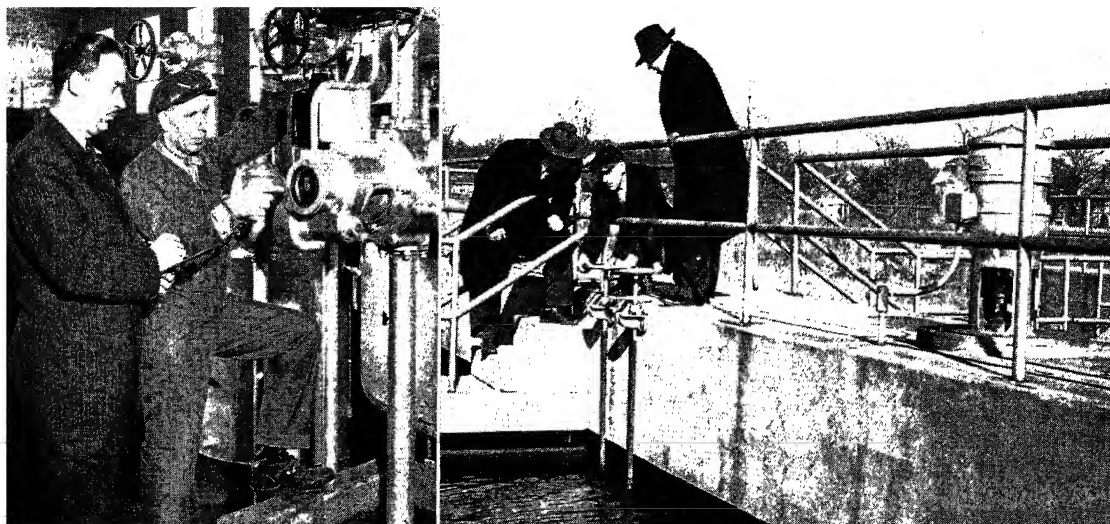
**SANITARY ENGINEER.** See SANITATION (Vocational Opportunities).

**SANITATION**, *SAN ih TA shun*, is the science of fighting disease by removing filth. Filth has always been unpleasant, and even ancient peoples had rules and methods of sanitation. The Hebrews are famous for their rules of sanitation, and the Romans for their sewers and aqueducts. The ancients even seem to have known that filth had something to do with disease. But no one knew the connection between them until disease germs were discovered, and science proved that they thrived in filth. Diseases resulting from filth were serious in all civilized countries until about 1900. Since then, organized sanitation has played an important part in sharply reducing the death rate from infectious diseases.

Sanitary measures were not well organized in the United States until 1861, when the U.S. Sanitary Commission was founded. The chief government department for sanitation is now the United States Public Health Service. It was reorganized in 1912. England had no thorough improvement in sanitation until the report of the Royal Sanitary Commission in 1871. The movement for sanitation has now spread throughout the civilized world.

Sewage disposal is one of the greatest sanitary problems, especially in large cities. Indoor plumbing and sewage systems have provided for removal of human discharges from the community. Before indoor plumbing, the near-by outhouses and the practice of throwing bath water on the nearest patch of ground, were probably the most important causes of filth-bred diseases. Indoor plumbing and sewage are the most important of





Cook County Dept. of Public Health

**Inspectors Keep City Drinking Water Safe (left) and Check the Operation of Sewage-Disposal Systems (right)**

all sanitation measures. Most cities remove sewage by diluting it in a large body of water, such as a lake, river, or ocean. This method is safe only if the body of water is large enough to take care of the amount of sewage.

One of the worst sanitary problems around large cities is the pollution of water by sewage and chemicals from factories. A disposal plant is the best way to remove sewage. The plant separates the sewage into solids and liquid, purifying the water and preparing the solid refuse to be used as fertilizer.

Modern cities also have large plants to purify their drinking water. Almost all cities in the United States use chlorine in their water. Other cities filter the water and use the storage system, which allows the sediment to settle. Cities also have regular inspection of swimming pools and beaches, and adopt sanitation rules for persons who use them.

The inspection of milk, meat, and other foods is another important part of sanitation. The United States Public Health Service has written up a set of model pure-milk rules for states and communities. They include pasteurization, a method of heating the milk to kill bacteria in it. The United States Government examines meat sent from one state to another. Some

states also have strict meat inspection, but others do not. Meat from diseased cattle is known to spread tuberculosis, while swine and cattle spread hookworm.

Sanitation measures include fighting rats, which spread bubonic plague, and ground squirrels, which spread a disease called sylvatic plague. Rabbit fever, parrot fever, and rabies in dogs also must be combated.

The best-known of the insects which carry diseases are mosquitoes and flies. Sanitary measures against them include draining sluggish ponds and marshes, and the use of insecticides and screens. Garbage is put in containers which keep out the insects that breed in the refuse. Tight garbage containers also help protect against rats.

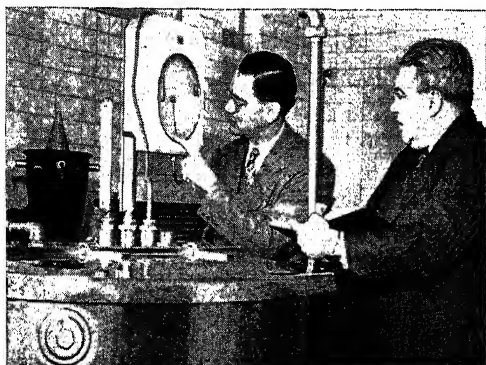
Personal cleanliness also plays a large part in sanitation. Persons who have a disease can pass it on easily to others who come in contact with them. Many diseases are spread when persons use the same cup, towel, or a similar personal article. Careful washing and bathing is a duty for those who handle food or stay around the sick. Special care must be taken to isolate sick persons and destroy their body discharges. At the same time, healthy persons must guard their health with sanitary practices.

The science of sanitation has done much to prevent epidemics. Quarantines were in force before people knew about germs, and enforcing them is still one of the chief duties of the sanitation officer. If an epidemic strikes a community, both vaccinations and disinfectants may be used. The United States First Army stopped an epidemic of typhus fever in Italy by using the powerful insecticide, DDT.

**Vocational Opportunities.** There are many vocational opportunities for sanitary engineers, particularly in the field of municipal, state, or Federal Government work. The armed forces also require men trained in sanitary engineering.

**Related Subjects.** The reader is also referred to:

Aqueduct	Disinfectant
Bacteria	Epidemic
Baths and Bathing	Fly
Board of Health	Garbage Disposal



Cook County Dept. of Public Health

**Chemists Inspect a Milk-Pasteurization Machine**

Health (Public Health)  
Hygiene (Public Hygiene)  
Mosquito

Public Health Service  
Sewage  
Waterworks

**SAN JACINTO, BATTLE OF.** The final battle of the war for Texan independence was fought near the intersection of the San Jacinto River and Buffalo Bayou in Texas. The Mexican general, Antonio López de Santa Anna, commanded a force of about 1,250 men. The Texans, under General Sam Houston, had only about 780 men. Following a long retreat, the Texans took the overconfident Mexicans by surprise, and won a complete victory within fifteen minutes. Nearly every man in the Mexican army was killed or captured. Santa Anna himself was taken prisoner the following day. The Texan losses at the Battle of San Jacinto were sixteen killed and twenty-five wounded. General Houston was shot through the ankle. See also TEXAS (Other Interesting Places to Visit).

J.D.H.

**SAN JACINTO MOUNTAIN.** See CALIFORNIA (Location, Size, and Surface Features).

**SAN JOAQUIN, *wah KEEN*, RIVER** is an important waterway in California. It rises in a small glacier on the eastern slope of the Sierra Nevadas in Tulare County. It flows southwest, then turns northwest to cross the fertile San Joaquin Valley. The San Joaquin meets the Sacramento River in the marshy flood plain at the head of Suisun Bay. The San Joaquin flows through the mountains for 125 of its 350 miles. Boats can sail up the river as far as Stockton, a distance of fifty miles. The San Joaquin Valley is often called "the granary of California." The region forms the southern part of the Great Valley of California and is one of the leading irrigated farming sections of the state.

L.D.JR.

**SAN JOSE, *san hoh SAT*, Calif.** (population 68,457). More fruit is dried and canned in San Jose than in any other city in the world. San Jose lies near the southern end of the San Francisco Bay. The mountains of the Coast Range lie on the west. The Mt. Hamilton Range spreads north and east of the city. San Jose is the home of San Jose State College. This community was settled in 1777 as the Pueblo de San Jose Guadalupe. In 1849 San Jose became the first capital of California, and in 1850 it was the state's first incorporated city. The city is the seat of government of Santa Clara County. See also CALIFORNIA (religion).

P.R.H.

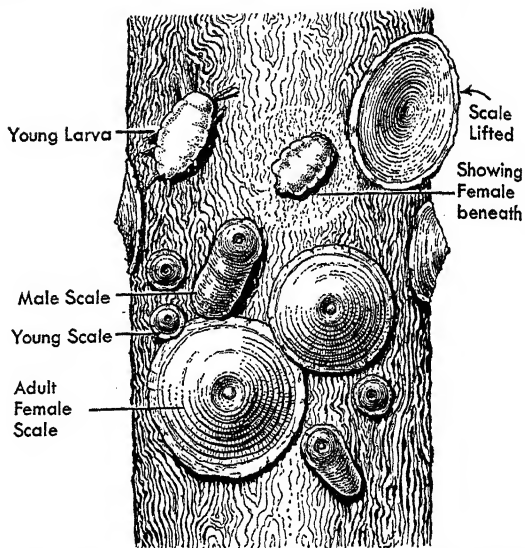
**SAN JOSÉ** (population 76,178), is the capital and largest city of Costa Rica. It lies in a fertile valley of the central plain, about halfway between the eastern and western coasts of Costa Rica. San José is on the trans-continental railroad which connects the port of Puntarenas with the port of Limón. The city is about 3,500 feet above sea level, and has a pleasant climate throughout the year.

Attractive buildings line well-paved and well-lighted streets. The town was partly destroyed by a terrible earthquake in 1924, but was rebuilt. San José factories produce leather goods, textiles, candles, beverages, and furniture.

I.J.C.

**SAN JOSE ROSE GARDEN.** See FLOWER (Garden Flowers [Famous Flower Gardens]).

**SAN JOSÉ SCALE** is the most destructive of the scale insects. It is commonly found on shrubs and fruit trees throughout the United States and Canada. The largest



**Enlarged View of the Life Stages of the San José Scale** as seen on the trunk of a fruit tree.

insects are no larger than the head of a pin. It has been estimated that one female scale may produce over 3,216,080,000 young insects a year. The branches of infected trees are literally powdered with their tiny bodies. Because these insects give off a gray, scaly wax, the plants look as if they were coated with ashes. Like other scale insects, the San José scale sucks the sap of the host plant.

The danger of the pest is increased by the great number of kinds of plants on which it can feed. These plants include orchard and small fruit trees, the members of the rose family, the pecan, the English walnut, the elm, and other trees. The fruits of infected apple and pear trees show a reddish discoloration of the skin and are often rough, pitted, and distorted in shape, or cracked. A full-grown apple tree may resist these insects for several years, but a young peach tree is often killed in two seasons.

The pest takes its name from that of the city in California in which it was discovered in 1880. It is believed to have been introduced on trees brought from China. The insect was not found east of the Rocky Mountains until 1893, but by 1895 it had become widespread.

The pest is spread by infected nursery stock. The scales are scattered by the wind, and are carried on the feet of birds and flying insects. The Chinese ladybird beetle is a natural enemy of the pest, and the chalcidid fly destroys the adult scales. A mixture of lime and sulfur, and certain sprays containing oil, are standard remedies.

G.P.

**Classification.** The scientific name of the San José scale is *Comstockaspis perniciosus*; of the family *Coccidae*; and the order *Homoptera*.

**SAN JOSE STATE COLLEGE** is a publicly controlled coeducational school of the liberal arts in San Jose, Calif. Students live in boarding houses. Many students earn part or all of their expenses. The college was founded in 1857 and has an average enrollment of about 3,800.

**SAN JUAN**, *san HWAHN*, Puerto Rico (population 169,247), is the capital and chief seaport of the island. The older part of the city lies on an island off the northern coast of Puerto Rico, with modern residential districts across the channel on the main island. Four bridges and a highway over the water link these parts of the city. Tobacco manufacture is the most important industry of San Juan. San Juan is the only fortified city in Puerto Rico. Some of the Spanish forts and the walls that surround the older part of the city are 250 years old. Morro Castle, built in 1584, lies on a bluff dominating the entrance to the bay, which is one of the best harbors in the West Indies. The city was founded in 1511 by Ponce de León, and was the seat of the Spanish provincial government. It had a stormy history, being attacked at various times by the Dutch, English, and Americans. Many old Spanish buildings still stand. F.M.F.

**SAN JUAN BAUTISTA**, *baw TEES tah*, was the name given by Columbus to Puerto Rico. See PUERTO RICO (History).

**SAN JUAN ISLANDS**. This group of islands in Puget Sound is noted for its good fishing and vacation resorts. The islands are part of the state of Washington. They lie between Washington and Vancouver Island. They are protected from winds by the near-by Olympic Mountains, and as a result have a dry, sunny climate throughout most of the year.

The three chief islands are Orcas, San Juan, and Lopez. Rock quarries and food-packing plants are the basis of industrial life on the island. Friday Harbor (population 658) is the largest town. It is the chief port of the islands, and is the county seat of San Juan County. The marine laboratory of the University of Washington is near Friday Harbor. The islands were given to the United States by arbitration in 1872 after a dispute with Great Britain over their ownership. O.W.F.

**SANKEY, IRA DAVID** (1840-1908), was an American gospel singer and hymn writer. He was born in Edinburgh, Pa., and attended high school there. Sankey became known through his association with Dwight L. Moody, the preacher and evangelist. See also MOODY, DWIGHT L. R.KEN.

**SAN LUIS POTOSÍ**. See MEXICO (Cities).

**SAN MARINO**, *mah RE nah*, is the smallest and one of the oldest republics in Europe. Pope Urban VIII recognized San Marino as an independent state in 1631. San Marino is located on a mountaintop in the Apennine Mountains of eastern Italy. The little republic is near the coast of the Adriatic Sea, and about twelve miles southwest of the Italian port of Rimini. San Marino covers an area of thirty-eight square miles, and has a population of 14,545. The chief occupations of the people are quarrying, cattle raising, and wine making. The republic issues its own postage stamps and coins, principally for sale to foreign collectors of these items.

The legislative assembly of San Marino is called the Great Council. It is made up of sixty members who are elected by popular vote. Two council members are chosen every six months to act as executive regents. A small executive council helps the regents handle the affairs of the country. San Marino has been friendly with Italy since 1907. In World War I the republic joined Italy in the war against Germany. San Marino fought

with Italy against the Allies during World War II.

The capital of the republic is also known as San Marino. It is a small, old-fashioned town with crooked cobblestone streets. The customs of the people remain much the same as they were during the 1400's. H.V.B.K., Jr.

See also ANDORRA; FLAG (color plate, Flags of Europe); LIECHTENSTEIN; MONACO; VATICAN CITY.

**SAN MARTÍN**, *sahn mahr TEEN*, **JOSÉ DE** (1778-1850), was an Argentine general who fought for the independence of South America in the wars with Spain. He and Simón Bolívar were the two great leaders in the cause of South American independence.

San Martín was born at Yapeyu in what is now the Argentine Republic. He was sent to Spain for his education. There he fought with the Spanish forces against Napoleon, and in 1811 became a lieutenant colonel in the Spanish army.

The Spanish colonies in South America had already rebelled against the mother

country, and San Martín sailed for Buenos Aires. On his arrival he was given command of a patriot army. He decided at once that the best policy was to carry the war to Chile, where there was a Spanish army which he hoped to attack without warning.

After nearly three years of preparation, San Martín undertook the campaign for which he is famous. In spite of terrible hardships he led his army over the snow-covered Andes and through the Uspallata Pass. In 1817 he appeared before the astonished Spaniards on the Chilean side of the mountains. He joined forces there with Bernardo O'Higgins, the "George Washington of Chile." Together they defeated the royalists at Chacabuco and on the river Maipo. By the end of 1818 they had driven the royalists out of Chile.

San Martín later went to Peru and helped that country to win its freedom. In 1821 he was made Protector of Peru. In 1822 he and Bolívar met for the first and only time in a conference at Guayaquil. The two generals disagreed and soon parted. San Martín gave up his command in Peru and returned to Argentina.

He became discouraged by the quarrels and disputes that disturbed Argentina after the liberation. He was too unselfish to take part in the struggle for power in Buenos Aires, and soon left for Europe. He died in poverty in France after many years of exile. E.T.P.

See also CHILE (History).

**SAN MARTÍN'S FLAG**. See FLAG (color plate, Flags of Latin America).

**SAN MATEO**, *mah TAY oh*, **MERCHANT MARINE CADET BASIC SCHOOL**. See SAN FRANCISCO (History).

**SAN MIGUEL**. See SALVADOR, EL (Cities).

**SAN PEDRO DE MACORÍS**. See DOMINICAN REPUBLIC (Cities).

**SAN PEDRO NAVAL AIR STATION**. See LOS ANGELES (Interesting Places to Visit).



LIBERATOR OF ARGENTINA, CHILE, AND PERU

Little, Brown & Co.

**José de San Martín** fought for South America's independence from Spanish rule. (From "He conquered the Andes," by Mabel Lorenz Ives, illustrated by Forrest Orr.)

**SAN PEDRO SULA.** See HONDURAS (Cities).

**SAN REMO.** See ITALY (Cities).

**SAN SALVADOR** (population 105,193), is the capital of El Salvador. The city lies in a pleasant valley about 2,000 feet above sea level. San Salvador is an important business and railroad center. The merchants of the city carry on a brisk trade in coffee, tobacco, rubber, sugar, and other agricultural products.

San Salvador lies in the heart of an earthquake region. An earthquake and volcanic eruption destroyed many of the city's old buildings in June, 1917. San Salvador was later rebuilt along modern lines. I.J.C.

**SAN SALVADOR ISLAND, or WATLING ISLAND.** See BAHAMAS.

**SANS-CULOTTE, SANZ kyoo LAHT.** See DRESS (Eighteenth Century).

**SAN SEBASTIAN.** See SPAIN (Cities).

**SANSKRIT LANGUAGE AND LITERATURE** were the language and literature of ancient India. The Sanskrit language is divided into two periods. Old Sanskrit is the language in which the holy *Vedas* were written. Old Sanskrit is also called *Vedic Sanskrit*, or simply *Vedic*. The second period is that of classical Sanskrit. Its literary remains are chiefly devoted to subjects other than religion.

It is not definitely known when Sanskrit was introduced into India, but 1500 B.C. is the date generally accepted. For a period Sanskrit was the common speech of the people, as well as the literary language. But by the

came. Moreover, the study of the *Rig-Veda* is important for comparative mythology and comparative religion.

**Sanskrit Literature** began with the *Vedas*. These are the sacred Hindu books and constitute the oldest work in any Indo-European language. The works of the Vedic period are religious and were long transmitted orally. They are composed of the *Rig-Veda* (about 1000 B.C.), the *Sama-Veda*, the *Yajur-Veda*, and the *Atharva-Veda*. The *Vedas* are discussed in the *Brahmanas* (about 800-600 B.C.). Religious philosophy is taught in the *Upanishads* (about 600-300 B.C.).

In its second, or classical, period the literature was mostly secular, or nonsacred. The outstanding epics are the *Mahabharata* (200 B.C.?) and the *Ramayana*. There are traces of dramas in the 300's B.C., and the author Kalidasa appears to be India's Shakespeare. There are also lyric and instructive poems, laws (*Manu*), and philosophical works of various schools, such as the *Vedanta*, *Sankhya*, and *Yoga*. India's chief contributions to Western literature are in the fields of fiction and fable. Indian fairy-tale motifs appear in the *Arabian Nights* and in medieval legends and stories. The *Panchatantra* is the chief Sanskrit collection of fables. R.H.P.

See also MAHABHARATA; RAMAYANA; VEDA.

**SAN STEFANO, TREATY OF.** See BERLIN, CONGRESS OF; BULGARIA (Independence); RUSSO-TURKISH WARS (Wars of the 1800's).

**SANTA ANA.** See SALVADOR, EL (Cities).

**SANTA ANNA, SAHN tah AH nah, ANTONIO LÓPEZ DE** (1795?-1876), was a Mexican soldier and politician. He was born in Jalapa, in the province of Veracruz. At the age of fifteen he became a cadet in the Spanish colonial army stationed in Mexico. He thus began his long career by fighting against the Mexicans in the War of Independence. Toward the end of the struggle he deserted the Spanish cause and joined forces with Augustín Iturbide, who was victorious and declared himself emperor.

Santa Anna expected the new emperor to make him governor of Veracruz as a reward for his services. But Iturbide failed to do so. Santa Anna became angry and led a revolt against him. Iturbide was driven from power.

In 1829 Spain made a tardy attempt to reconquer Mexico. Santa Anna, as commander in chief of the Mexican army, won several victories, and the Spanish invasion was defeated. In 1833 he became president.

As President of Mexico, Santa Anna had little regard for the law and ruled with a high hand. He did away with the federal constitution and placed the governors of the various provinces under his personal control. These acts caused an immediate revolt in Texas, which was still a part of Mexico but which had been settled by people from the United States.

Santa Anna rushed northward to put down the revolt.

## स्मरति

**An Example of Sanskrit** which was written in India many years before the coming of Jesus Christ. Translated, the writing means: (a) Two crows dwell in a tree; (b) The God speaks; (c) Why does the son not remember the father?

500's B.C. local dialects had sprung up. Buddha preached his doctrine in one of these. Panini (300's B.C.) was the first and greatest Indian grammarian. He fixed the characteristics of *Sanskrit* ("purified, perfected") in contrast with the common spoken language *Prakrit* ("unnatural, unpurified").

*Om* is a sacred syllable in the Sanskrit language, similar in meaning to the English *amen*. It might well be translated, *So it shall be*. It was supposed to be uttered at the beginning of every Vedic recitation and again at its close. This gave assurance that the understanding of what was spoken should not be lost. Later the syllable referred to the Hindu Trinity of Vishnu, Brahma, and Siva. It symbolized the abstract unity of the universe: Absolute (a) and Relative (u) are related (m). (a-u-m, pronounced *om*).

**The Importance of Sanskrit** to scholars can not be overlooked. The knowledge of Sanskrit reached Europe late in the 1700's. It enabled Franz Bopp (1791-1867) to lay the foundations of Indo-European language study. The Hittite documents are the earliest written remains of Indo-European speech. But Sanskrit's system of consonants is the most primitive. It gives us some notions of the sounds of the common stock from which Greek, Latin, English, German, Persian, and other languages



Ayer Coll., Newberry Library

**Santa Anna** was a ruthless Mexican general who won the Battle of the Alamo.

He attacked San Antonio and in March, 1836, stormed the Alamo with a great army that outnumbered the Texans thirty to one. The defenders were slain to the last man. Then Santa Anna hastened on to attack the main Texas army under General Sam Houston. He met Houston at San Jacinto and there suffered a terrible defeat. His army was routed and Santa Anna himself was taken prisoner. Before the Texans freed him they forced him to sign a treaty acknowledging the independence of Texas. But in Mexico City the treaty was disowned and Santa Anna was removed from power.

In 1838 the French attacked Vera Cruz. Santa Anna took command of the troops and lost a leg in the fighting. From 1841 to 1844 he was president again. In 1844 there was a revolt against him and he fled to Jamaica. In 1846 war broke out with the United States. Santa Anna returned the next year and took command of the army. The American forces defeated him at Buena Vista, at Cerro Gordo, and at Chapultepec. After the fall of Mexico City, Santa Anna gave up his command and left the country. He lived for some years in Jamaica and Venezuela.

In 1853 he returned to Mexico and became president again. He soon declared himself president for life and gave himself the title of Most Supreme Highness. Within two years he was overthrown and again exiled. He tried to return during the French invasion of Mexico in 1864, but was not allowed to enter the country. He returned in 1874 after the death of President Benito Juárez and died in poverty in Mexico City. E.T.P.

**SANTA BARBARA MISSION.** See CALIFORNIA (Religion); UNITED STATES OF AMERICA (colonplate, Historic American Buildings).

**SANTA CATALINA**, another name for Catalina Island. See CATALINA ISLAND.

**SANTA CLARA, UNIVERSITY OF**, is a men's school in Santa Clara, Calif. It is controlled by the Jesuits of the Catholic Church. Students of all faiths are accepted. Courses are offered in the liberal arts, sciences, engineering, business administration, premedicine, and law. The university was founded in 1771 and has an average enrollment of about 550. c.j.w.

**SANTA CLAUS** is the patron saint of Christmas and the most beloved figure in the legends of childhood. The modern mythical Santa Claus developed from the real person Saint Nicholas. Saint Nicholas was the youngest and one of the kindest bishops in the history of the Roman Catholic Church. During the Middle Ages he grad-

ually became the patron saint of schoolboys. European schoolboys celebrated his feast day on December 6 by electing a boy-bishop. Dressed in magnificent robes, the boy-bishop led a parade which wound through the narrow streets and sometimes entered the churches. There was much feasting, but on the whole the occasion was solemn.

Later this custom died out, although Nicholas still remained the favorite saint of children. In Belgium and The Netherlands both young and old still celebrate his

feast day. A person representing the saint and wearing the robes of a bishop rides through the streets on a white donkey. Saint Nicholas is kind but he is also strict. If Hans and Katrina have been good children, they find gifts in their wooden shoes. But bad children find only a bundle of switches in their shoes.

Children loved Saint Nicholas and his habit of bringing gifts so much that the custom of celebrating his feast day did not die out. The Dutch settlers in America brought the custom with them to New Amsterdam (now New York City). English settlers in America eagerly borrowed the legends and festivities surrounding the kindly Saint Nicholas. English-speaking children tried to pronounce the Dutch name for the saint, San Nicholaas. But they said it quickly and excitedly, and soon the name



Harold M. Lai

**Jovial and Kindly Santa Claus** reads a letter from a young admirer, before starting on his Christmas rounds.

changed to Santy, or Santa, Claus.

Only American children say Santa Claus, and even in America during the first half of the 1800's, the saint was still known as Saint Nicholas or Saint Nick. In 1809 Washington Irving wrote of the saint as the guardian of New York City in his *Knickerbocker's History of New York*. He described him as a jolly fellow with a broad-brimmed hat, huge breeches, and smoking a long pipe. Irving's Saint Nicholas rode over the treetops in a wagon. He took presents from his pockets and dropped them down chimneys.

In 1822 Clement C. Moore wrote for his children the poem "A Visit from St. Nicholas," which gives a more familiar picture of the saint as we know him today. But even in this poem, which begins with the familiar line "Twas the night before Christmas," the name of Santa Claus does not appear. But the saint has become a round and jolly figure with twinkling eyes, a red snub nose, and a white beard. The long pipe has become a stump of a pipe, and his wagon has become a sleigh. His Dutch costume has changed to a suit trimmed with fur. At some point, also, the legend developed in America that his



sleigh was pulled by reindeer. The reindeer appear in Moore's poem. Probably Scandinavian settlers in America added this detail to the story.

Thomas Nast, the cartoonist, gave the first picture of Santa Claus as he is imagined today in a cartoon, in 1863. Later his famous drawing "Santa Claus and His Works," which appeared as a Christmas picture in *Harper's Weekly* in 1866, showed Santa Claus in his workshop with his record of the good and bad deeds of all children. The drawing also showed the sleigh with reindeer, the pack of toys, the stockings hung at the fireplace, and the Christmas tree.

In other countries, Saint Nicholas has taken other forms. Many English children believe in a Father Christmas who brings them gifts. To them he is a gentleman dressed in a long tail coat and a squarish beaver hat. German children speak of Kris Kringle and French children of Père Noël (Father Christmas). But to all children in all Christian lands, he stands for the same thing, the kindly spirit that the Christ Child brought into the world.

H.A.MY.

See also CHRISTMAS; NICHOLAS, SAINT.

**SANTA CLAUS**, Ind. (population 250). Every December children send thousands of letters addressed to "Dear Santa Claus" into the tiny post office of this small southern Indiana town. Packages come from nearly everywhere to be remailed with the magic postmark. Except for this Christmas rush of mail, Santa Claus has no other claim to fame. When the village was founded in 1846, it was named Santa Fe. But it was discovered that Indiana already had a post office by that name, and someone jokingly suggested "Santa Claus" as a substitute. A small park in the town has a statue of Santa Claus dedicated to "The Children of the World." It was the gift of Carl A. Bartlett of Chicago. There is also a Christmas "wishing well" for children. Santa Claus is about ten miles north of the Ohio River and about six miles east of Lincoln City, the site of the grave of Abraham Lincoln's mother.

W.O.L.

**SANTA CRUZ**. See BOLIVIA (Cities).

**SANTA CRUZ, ANDRÉS** (1792?-1865). See BOLIVIA (Early National Period).

**SANTA CRUZ ISLANDS** lie in the Pacific Ocean about 1,560 miles northeast of Sydney, Australia. The Santa Cruz island group is part of the greater Solomon Islands group. They are administered as part of the same British Protectorate as the Solomon Islands. The chief islands of the Santa Cruz group are the "Big" Santa Cruz, Utupua, and Vanikoro. One of the smaller land masses is the active volcanic island of Tinohula. The natives of Santa Cruz are Melanesians, and are widely known as builders of seagoing canoes.

E.E.EI.

**SANTA CRUZ Y ESPEJO**, *SAHN tah KROOS ee es PAY ho*, **FRANCISCO JAVIER DE** (1747-1795), was a doctor and patriot of Ecuador. He was born and educated in Quito, where he received the degree of doctor of medicine in 1767. His efforts to improve the health of the city aroused the hatred of other doctors and of government officials. Santa Cruz wrote many books in which he praised rebellion and advocated better sanitation. His frequent imprisonments because of his patriotic activities broke down his health and he did not live to see the results of most of his efforts.

V.CO.

**SANTA FÉ**. See ARGENTINA (Cities).

**SANTA FE**, N.M. (population 20,325), has been a seat of government longer than any other state capital in the United States. The city was founded as the capital of the province of New Mexico in the winter of 1609-1610 by the Spanish governor, Pedro de Peralta. It was once the end of the Chihuahua and Santa Fe trails. The city lies 6,996 feet above sea level. The tourist trade is the most important business in Santa Fe. Many artists and writers make their homes here. The old adobe Palace of the Governors (now called the Old Museum) is filled with relics of the history of New Mexico. The new Art Museum is one of the cultural centers of Santa Fe.

Among the old churches in the city are the Cathedral, and the old San Miguel Mission. Santa Fe is the home of the Laboratory of Anthropology and the Museum of Navaho Ceremonial Art.

D.WO.

**SANTA FE DAM** is a flood control project on the San Gabriel River, about twenty-nine miles above its mouth in southern California. The dam is of the rolled earth-fill type and is designed to hold back a volume of 53,200,000 cubic yards of water. It is 92 feet high, and 24,100 feet along the top. The Santa Fe Dam is a project of the United States Army Corps of Engineers. See also DAM.

**SANTA FE TRAIL**. See GREGG, JOSIAH; TRAILS OF EARLY DAYS.

**SANTA GERTRUDIS**, *her TROO dees*. See CATTLE (Other Beef Cattle).

**SANTA MARIA**. See CARAVEL; COLUMBUS, CHRISTOPHER (First Voyage to America).

**SANTA MARTA**. See COLOMBIA (Cities).

**SANTA MONICA**, Calif. (population 53,500). This modern city and beach resort is situated about fifteen miles west of Los Angeles, on the crescent-shaped Santa Monica Bay. The city was probably named by Father Crespi, a Spanish missionary who camped on the site on Saint Monica's Day in 1769. The Douglas Aircraft Company is one of the largest industries in the city. Ocean Park, a southern section of Santa Monica, is a beach amusement center. It is often called the "Coney Island of the West." Small homes in the city's residential sections stretch to the near-by Santa Monica Canyon, where there are many large mansions and estates. P.R.H.

**SANTANA**, *sahn TAH nah*, **PEDRO** (1801-1864). See DOMINICAN REPUBLIC (History).

**SANTANDER**, *SAHN tahn DAIR*, **FRANCISCO DE PAULA** (1792-1840), was a South American soldier and statesman. From 1822 to 1827 he governed New Granada (now Colombia) as acting president while Simón Bolívar was absent. Later, as president from 1832 to 1837, he encouraged national industry, built up a trained army, and established schools and courts.

Santander was born in Cúcuta and was educated in Bogotá. He studied law but enlisted at eighteen in the revolutionary army. At twenty-five he was promoted to the rank of full general. In 1828 he was exiled for political reasons, but returned after Bolívar's death.

V.CO.

**SANTA ROSA ISLAND**. This long, narrow island lies outside Pensacola Bay off the northwestern Florida coast. Santa Rosa Sound separates the island from the mainland. Santa Rosa Island is about fifty miles long (from east to west) and averages about a mile in width. Its area

is forty-nine square miles. The island is a popular playground for visitors from Pensacola, Fla., and Birmingham, Ala. Santa Rosa Island National Monument (4,800 acres) was maintained by the Federal Government from 1939 until 1946, when the area was turned over to Florida as a state park. Fort Pickens Military Reservation, an important post during the War between the States, is on the western end of the island.

**SANTA**, or **SAINT, SOPHIA**. See SAINT SOPHIA.

**SANTA TOMAS**, *toh MAHS*. See PHILIPPINE ISLANDS (Social and Cultural Achievements [Education]).

**SANTAYANA**, *SAHN tah YAH nah*, **GEORGE** (1863- ), is an American philosopher, essayist, and poet. His basic philosophy might be called skepticism, but

his works teach also that the beliefs with which he differed have value so long as they work.

Santayana was born in Madrid, Spain, but was taken to Boston when he was nine years old. He was graduated from Harvard University in 1886 and then studied for two years in Berlin. Santayana taught philosophy at Harvard from 1889 to 1912, and then moved to England. In 1932 he finally settled in Rome. C.M.E.

His Works include *The Sense of Beauty; The Realm of Truth; The Last Puritan; Persons and Places; The Idea of Christ in the Gospels; and Character and Opinion in the United States*.

**George Santayana** taught philosophy at Harvard University for 23 years.

*Persons and Places; The Idea of Christ in the Gospels; and Character and Opinion in the United States.*

**SANTEE-COOPER PROJECT** is an electric-power and navigation construction located thirty-six miles north of Charleston, S.C. The project contains two lakes. One is formed by Santee Dam, which is seven and a half miles long with a 3,400-foot concrete irrigation spillway in the center. The other part of the Santee-Cooper Project is made up of Pinopolis Dam and Dikes. This section is twenty-eight miles long.

Lake Marion, formed by Santee Dam, covers an area of 96,000 acres. Lake Moultrie, formed by Pinopolis Dam, covers an area of 65,000 acres.

The two lakes are connected by a six-and-a-half mile long diversion canal which turns the waters of Lake Marion into Lake Moultrie, through an electric power house and then through the Tailrace Canal into the Cooper River.

The Santee-Cooper Project was built by the South Carolina Public Service Authority. It was completed in 1942 at a cost of \$57,000,000.

See also DAM.

**SANTEE**, *SAN TE*, **RIVER**. See SOUTH CAROLINA (Rivers and Lakes).

**SANTIAGO**, *SAHN tee AH goh*, largest of the Cape Verde Islands. See CAPE VERDE ISLANDS.

**SANTIAGO** (population 639,546), is the capital and largest city of Chile. It lies in a colorful valley between the Andes Mountains and the Pacific coastal range, about

sixty-eight miles southeast of the city of Valparaíso.

Several large parks help to make Santiago one of the loveliest South American cities. Broad streets and new buildings add to the city's beauty. Santiago is the home of the Catholic University, the National Institute, and the University of Chile, which was founded in 1743. Industries in Santiago include shoe factories, flour mills, breweries, and tanneries. I.J.C.

**SANTIAGO, BATTLE OF**. See SPANISH-AMERICAN WAR (Chief Events).

**SANTIAGO CONFERENCES**. See PAN AMERICAN CONFERENCES.

**SANTIAGO DE CUBA**. See CUBA (Cities).

**SANTIAGO DE LOS CABALLEROS**. See DOMINICAN REPUBLIC (Cities).

**SANTO DOMINGO**. See DOMINICAN REPUBLIC.

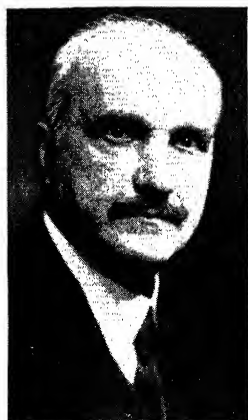
**SANTOS**. See BRAZIL (Cities).

**SANTOS-DUMONT**, *sahn TOHS-dyoo MAWN*, **ALBERTO** (1873-1932), was a pioneer in aviation. He was born in São Paulo, Brazil, but was educated in France and spent most of his life in Paris. His first flight was made in a free balloon in 1897 near Paris. A year later he tried unsuccessfully to fly a cigar-shaped dirigible fitted with a gasoline motor and a propeller. In 1899 he was successful in a similar flight.

Two years later Santos-Dumont won a \$20,000 prize for flying a dirigible from the Parisian suburb of Saint Cloud to the Eiffel Tower and back. He made the trip in twenty-nine minutes, which was less than half the time limit set. The next year he tried to fly across the Mediterranean Sea, but the balloon fell into the Bay of Monaco. Santos-Dumont was rescued. In 1906, three years after the Wright brothers made their first flight, Santos-Dumont made a short airplane flight. In 1909 he successfully flew a "grasshopper," or light plane, he had built. Late in life Santos-Dumont returned to his native Brazil. M.V.C.

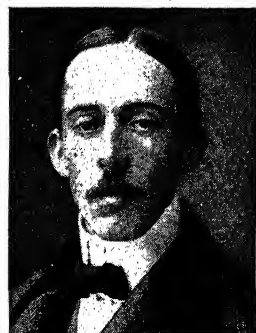
**SÃO FRANCISCO**, *soun frahn SEES koh*, or **SAN FRANCISCO, RIVER**. This swift-flowing stream of eastern Brazil rises in the state of Minas Geraes. It flows northeast, then eastward, to form the boundary between the states of Bahia and Pernambuco. Then the river turns to the southeast, and finally empties into the Atlantic Ocean, 1,800 miles from its source. Navigation on São Francisco is impossible in several sections. As it leaves the mountains in Minas Geraes, the river plunges over falls and rapids. Then it is a broad, navigable stream for 1,000 miles of its middle course. But 200 miles from the Atlantic, it again becomes swift and rocky as it makes its way over a series of rapids and a magnificent falls called Paulo Affonso. M.U.

**SAÔNE**, *sohn*, **RIVER** is a waterway in eastern France. It rises near the foothills of the Vosges Mountains. The Saône is the most important branch of the Rhône River, and joins it at Lyon. The Saône is 300 miles long. Light



George Santayana taught philosophy at Harvard University for 23 years.

*Persons and Places; The Idea of Christ in the Gospels; and Character and Opinion in the United States.*



Alberto Santos-Dumont helped develop the airplane.

ships can sail on it for a distance of 232 miles. Chalon-sur-Saône, a large, industrial city in Saône et Loire, is on the banks of the Saône River. W.R.McC.

**SÃO PAULO**, *soun POU loo* (population 1,120,405), is the second largest city in Brazil. Only Rio de Janeiro is larger. São Paulo lies on the uplands of Brazil, about 200 miles southwest of Rio de Janeiro. São Paulo is an important coffee-trading center. Other important industries in the city include cotton mills, hosiery mills, foundries, and shoe factories.

São Paulo is a modern and beautiful city. It stands about 2,500 feet above sea level, and has a vigorous and healthful climate. I.J.C.

**SÃO PAULO DE LOANDA**, *soun POU loo deh loh-AHN dah*. See ANGOLA.

**SÃO SALVADOR**. See BRAZIL (Cities).

**SÃO VICENTE**, *soun vee SENT ee*, or **SAINT VINCENT**. See CAPE VERDE ISLANDS.

**SAP**, in botany, means the water liquid in the stems and roots of plants. There are really two kinds of sap. One kind is water with dissolved minerals which is traveling from the roots to the leaves. It moves through a layer in the stem and trunk called the *xylem*. The other kind of sap is water carrying dissolved plant foods. It is moving from the leaves to parts of the plant where it is to be used or stored. This sap travels in a different layer called the *phloem*.

The first kind of sap begins with the activity of the root hairs, where water and minerals enter the plant. From the root hairs, the water with the minerals dissolved in it moves toward the inside of the root by osmosis. When it reaches the xylem layer of wood in the root, it moves up through the root into the xylem of the

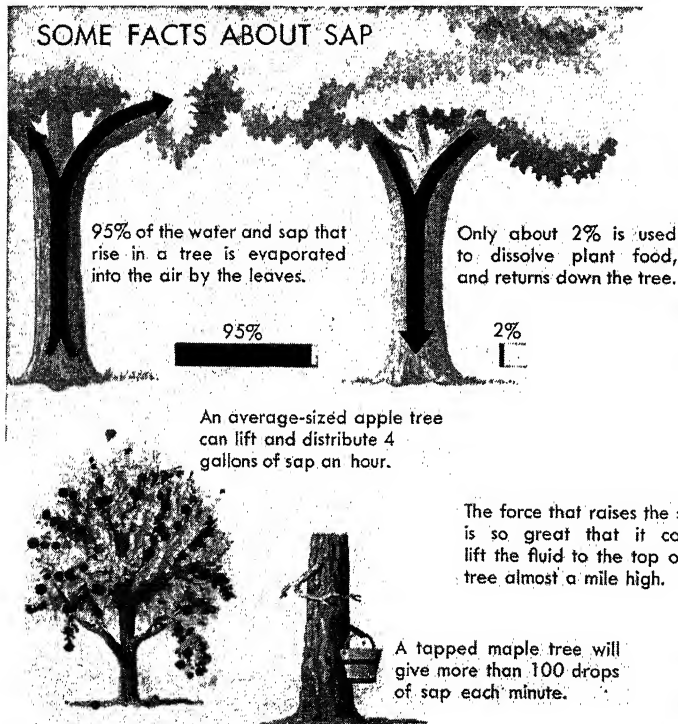
stem. Finally it passes to the leaves. The force which causes the sap to rise in the plant is, to a great extent, a pull from above. This pull results from the evaporation of water from the leaves.

In young trees the water moves through the xylem in all parts of the wood. But in old trees, the sap moves only through the xylem in the wood underneath the bark. This part of the wood is called *sapwood*. The part through which the sap does not move is called the *heartwood*. It is usually possible to tell these two kinds of wood from each other by their color. Sapwood is usually light, while heartwood is much darker.

The leaves are the organs of the plant which manufacture carbohydrates from carbon dioxide and water. The plant then uses the carbohydrates as food. Carbohydrates dissolve in water, and form the other kind of sap. In the stems and trunk of the plant, this stream of sap moves downward. At certain times of the year, in certain trees, the stream moving upward may also contain carbohydrates. An example is the sugar maple, whose rising sap contains sugar.

**Uses of Sap.** The sap of many plants is valuable to man. Most of the sugar sold in stores is made from the sap of the sugar cane. Many persons also use the sugar and sirup made from the sap of the sugar maple. Plants contain other liquids that are not true saps, from the botanical standpoint. The milky juice of the milkweed is a familiar example.

Many of these milky juices have considerable value. Several drugs come from milky plant juices. One of these is opium, made from the juice of a certain kind of poppy. The juice of the rubber tree is the raw material for most of the world's rubber. The gums and resins are



other plant juices that are valuable in the arts. C.J.H.

See also GUM; MAPLE SUGAR; OSMOSIS; PHLOEM; RESIN; RUBBER (Rubber from the Tree); TURPENTINE.

**SAPAJOU**, *SAP ah joo*, is the name of a group of American monkeys well known for their intelligence.



New York Zoological Society

**The White-fronted Sapajou Monkey** is regarded as one of the most intelligent members of the monkey family.

The monkeys that are carried about the city streets by organ-grinders are usually sapajous. The largest are over forty inches in length, including twenty inches of tail. In South America the Indians capture them by shooting arrows which are poisoned with curare. The captured monkeys are then given salt, which overcomes the effect of the poison.

Among the important kinds are the *white-fronted* sapajous, which live in the forests near the sources of the Amazon River. These sapajous have white foreheads and light-brown bodies. The *weepers*, or *capuchin monkeys*, are sapajous which have their hair arranged on the head like a cowl, or friar's hood.

In general, sapajous live in trees and eat insects and fruit. They sometimes eat eggs, young birds, and reptiles. South American Indians hunt them for both their flesh and their fur.

W.M.MAN.

**SAPODILLA**, *sap oh DIL ah*, is an important tropical tree. It gives us chicle, which is used in making chewing gum, as well as a delicious fruit. The sapodilla is native to tropical America. It is now also grown in southern Florida, India, Ceylon, and many other parts of the world. The tree is an evergreen, fifty to sixty feet tall. The bark contains a milky juice, or latex, which is boiled

down to make the chicle. The fruit is about three inches across and is round, oval, or cone-shaped. It has a reddish-brown skin, black seeds, and a thick, soft, yellowish-brown pulp, which has a flavor somewhat like a pear's and a perfume like flowers. It is a favorite in Florida markets and an important food in tropical America. The sapodilla also has a hard, durable wood. See also CHICLE; GUM; CHEWING.

W.P.O.

**Classification.** The sapodilla belongs to the family *Sapotaceae*. Its botanical name is *Sapota achras*.

**SAPONIN**, *SAP oh nin*. See SOAPBERRY.

**SAPOTA**, *sah PO tah*, **TREE**. See CHICLE; SAPODILLA.

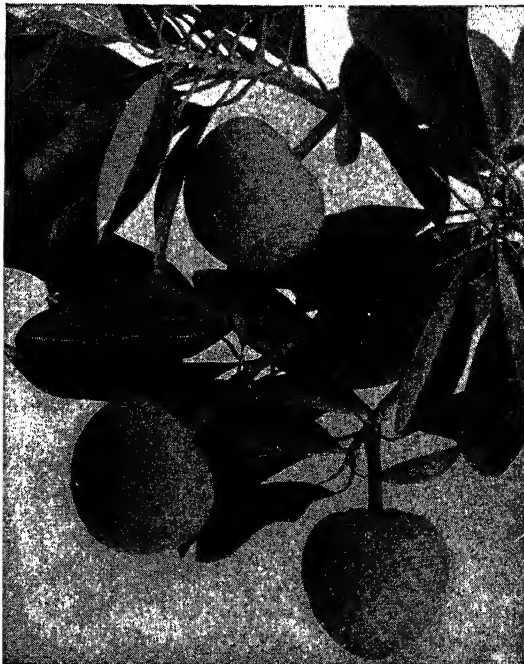
**SAPPHIRA**, *sa FI rah*. See ANANIAS.

**SAPPHIRE**, *SAF ire*, is a beautiful, transparent gem. It is one variety of the gem mineral corundum. Sapphires are usually thought of as gems of blue tints, which are due to impurities of iron and titanium. But sapphires of all colors of the rainbow are found. All the various colors are known as fancy sapphires except the red gems, which are rubies.

The finest blue stones are found in Kashmir, in northern India. The cornflower blue color, which is typical of Kashmir sapphires, is considered the measure of fine color in a sapphire. Large stones are about equal to a fine diamond in value. Sapphires from Ceylon are of a paler blue than Kashmir stones, and far less valuable. Australian gems are of a rich blue color in daylight, but appear black in artificial light. They are of less value than the Kashmir stones, which keep their color at night.

The Morgan collection in the American Museum of Natural History contains some remarkable examples of large sapphires. The sapphire is the birthstone for September. Ancient peoples regarded the sapphire as a love charm. See also CORUNDUM.

F.H.P.



U.S.D.A.

**and Fruit of the Sapodilla Tree of the Tropics**

**SAPPHO**, *SAP oh*, was a Greek woman poet who lived about 600 B.C. Aristotle ranked her with Homer, and Plato called her the "Tenth Muse." Her lyrics were passionate songs of love and nature. They were arranged in nine books, one for each Muse. (See MUSE.) She spent most of her life on the island of Lesbos, where she was head of a verse-writing school for girls.

*Ode to Aphrodite* is her only poem which remains today in its original form. Various fragments remain, but their beauty is lost in translation. C.H.O.

**SAPROPHYTE**, *SAP roh fite*. A saprophyte is a living thing that must get its food from dead plants or animals. The saprophytes are chiefly plants which lack the green substance chlorophyll. Plants with chlorophyll can manufacture their food from water and the carbon dioxide of the air, by the process of photosynthesis. Saprophytes must depend on food that has already been manufactured by some other living thing.

The best-known saprophytes are the plants known as fungi. They include the mushrooms, molds, mildew, rusts, and smuts. Partial saprophytes can manufacture their own food, but can not live unless there is also a large amount of decayed material in the soil.

Animals or plants which live on living organisms are known as *parasites*. W.C.BEA.

See also **CHLOROPHYLL**; **FUNGI**.

**SAPSUCKER** is one of a group of birds of the woodpecker family. It lives only in North America. Sapsuckers are so called because they feed somewhat on the sap of trees. They get this sap by making holes in the bark. They also feed largely on ants and frequently on wild fruit. The common sapsucker in the East is the *yellow-bellied sapsucker*. The male has a bright scarlet crown and throat, and black upper parts with white markings.



The Yellow-bellied Sapsucker is the villain among the woodpeckers, so far as man's interests are concerned. The many girdles of holes it drills around tree trunks often weaken or kill the tree, as the vital sap flows from them.

This sapsucker nests in the northern United States and Canada. In the winter it flies as far south as Central America. It builds its nest in holes in trees. The female lays three to seven eggs which are pure white. The southern *red-breasted sapsucker* lives on the Pacific Coast. The adults of both sexes have the crown, throat, and breast entirely red. The *Williamson's sapsucker* is found in mountain regions of the western United States.

Sapsuckers have much the same habits as woodpeckers, but are sometimes harmful, as they injure trees, and often make wood unfit for use. When large numbers of sapsuckers are found in any locality, it may be necessary to drive them away. The *Williamson's sapsucker* does little damage. L.A.HA.

**Classification.** Sapsuckers belong to the family *Picidae*. They are placed in the genus *Sphyrapicus*.

**SAPWOOD.** See **SAP**; **TREE**.

**SARABAND**, *SAR ah band*. See **DANCING** (Development of the Dance [Renaissance]).

**SARACEN**, *SAR ah sen*, was the name used in the Middle Ages, and hence by modern writers, to refer to the Moslems who invaded and occupied large parts of the Christian world in Asia, Africa, and Europe. This occupation took place during the 600's and 700's. The Saracens included the natives of Palestine and Syria, the Arab Moors who set up the Spanish kingdom in the 700's, and the Seljuk Turks who fought against the Crusaders.

The Greeks and Romans first used the term *Saracen* to describe the wandering Arab tribes of the Syro-Arabian desert. W.S.F.

**SARAGOSSA.** See **SPAIN** (Cities).

**SARAH**, *SAIR ah*, or *SAIY rah*. See **ISAAC**.

**SARAH LAWRENCE COLLEGE** is a women's school in Bronxville, N.Y. It is privately controlled. Courses are offered in liberal arts. Most students live in the college dormitories. The college was founded in 1928 and has an average enrollment of about 300. H.T.

**SARAJEVO**, *SAH rah yeh voh* (population 78,173), is a trading center in Yugoslavia. From 1878 to 1918 Sarajevo was the capital of Bosnia, a province of Austria. On June 28, 1914, the Austrian Archduke Francis Ferdinand and his wife were assassinated in Sarajevo. This was the immediate event that touched off World War I. See also **SERBIA**; **WORLD WAR I**. H.V.B.K., Jr.

**SARAN.** See **FIBER**; **TEXTILE**.

**SARANAC LAKES.** The Upper Saranac, Middle Saranac, and Lower Saranac lakes lie in the Adirondack Mountains of northeastern New York. The Upper Saranac is the largest. It is eight miles long, and in places is two miles wide. The lake is stocked with brook, lake, and rainbow trout, and whitefish. The Middle Saranac, which is usually known simply as Lake Saranac, is two miles long and one-half mile wide. The Lower Saranac is five miles long, and slightly over a mile in width. There are numerous islands. These lakes are all within a few miles of each other. They were created thousands of years ago by the action of huge glaciers. The rugged beauty of the Adirondack Mountain region attracts large numbers of tourists and sportsmen. L.D., Jr.

**SARASATE**, *sah rah SAH tay*, **Y NAVASCUÉS**, **PABLO DE** (1844-1908), was a brilliant Spanish violinist and composer. He was born at Pamplona, Spain, and



at an early age began to study violin with his father. He made his debut at the age of eight. Queen Isabella gave him a Stradivarius violin when he was ten and helped make it possible for him to study at the Paris Conservatory. He later made successful tours in all parts of the world.

G.B.

**His Works** include "Zigeunerweisen" for violin and orchestra; "Navarra" for two violins; and "Jota de San Fermin."

**SARATOGA**, *sar ah TO gah*, **BATTLE OF**. See **BATTLES**, **FIFTEEN DECISIVE**; **REVOLUTIONARY WAR IN AMERICA** (Most Important Battles).

**SARATOGA SPRINGS**, N.Y. (population 13,705), is a famous health resort and horse-racing center. The city lies in the southeastern foothills of the Adirondack Mountains, about thirty miles north of Albany.

The mineral springs here were visited by Father Isaac Jogues in 1643. In 1910 the state took over the springs. Saratoga Battlefield, the scene of an important battle of the Revolutionary War, is about twenty miles southeast of the city.

W.E.Y.

**SARATOV**. See **UNION OF SOVIET SOCIALIST REPUBLICS** (Cities).

**SARAWAK**, *sah RAH wahk*, is a British Crown Colony in the northwestern coastal section of Borneo. It covers an area of about 50,000 square miles, and has an estimated population of 490,585. Sarawak has a tropical climate. The chief products include sago palm, rubber, pepper, coconuts, and camphor. There are also valuable deposits of coal and oil.

Sarawak has only a few Europeans. The natives include various primitive tribes of Dyaks, Kayans, Muruts, and others. There are also many Chinese settlers. Sarawak was ruled by the Brooke family of England from 1841 to 1941. These "white rajahs" were driven out by the Japanese in World War II. The last Rajah Brooke ceded, or granted, Sarawak to the British government in 1945. Kuching (population 25,000) is the capital of Sarawak.

E.E.EI.

**SARCOLACTIC**, *SAHR koh LAK tik*, **ACID**. See **LACTIC ACID**.

**SARCOLEMMMA**, *SAHR koh LEM ah*. See **MUSCLE** (Voluntary Muscles).

**SARCOMA**, *sahr KO mah*. See **CANCER** (Kinds of Cancer).

**SARCOPHAGUS**, *sahr KAHF ah gus*, is a stone coffin usually placed in a vault or chapel. Ancient Egyptians regarded the sarcophagus as the home of their dead. For this reason, the covers of the stone receptacles were shaped like a house with a curving roof. The Greeks elaborately decorated the sides of their marble coffins with figures in relief. Of these probably the most famous and beautiful is the sarcophagus of Alexander in Istanbul. The Etruscans made decorative sarcophagi in terra cotta. The Romans preferred marble or stone. The best-known modern sarcophagi include the tomb containing the bodies of George and Martha Washington at Mount Vernon, the tomb of Napoleon in the Chapel of the Invalides, Paris, and the tomb of Lenin in the Kremlin at Moscow. See also **TOMB**.

K.J.C.

**SARDANAPALUS**, *SAHR dah nah PAY lus*, was king of Assyria in about 822 B.C. A legend says that he burned his palace, his wife, and himself when foreign troops

threatened to capture Nineveh, his capital. Lord Byron told the story in his drama *Sardanapalus*.

**SARDINE**, *sahr DEEN*, is a small fish of the herring family that is also known as the *pilchard*. The sardine, or pilchard, is found in great numbers along the coasts of Europe and North America. The name "sardine" comes from the fact that this fish was first caught off the island of Sardinia, near Italy. Today, many sardines are caught along the coast of the Mediterranean Sea, in the Bay of Biscay near France, and along the coast of the English Channel. In North America, sardines are caught along the Pacific Coast of the United States, Canada, and Mexico, especially in great numbers off the coasts of British Columbia, Washington, Oregon, and California.

The American sardine is found off the Pacific Coast of the United States and Canada. It is about ten inches long and weighs about 4 ounces. The upper parts of the body are dark blue and the lower parts are silvery.

Sardines eat the tiny one-celled plants and animals that live in the ocean. They usually swim in large groups called *schools*. In the daytime, the sardines can be seen in the water as tiny black spots, causing ripples. At night, they may glow in the dark waters.

Sardines are very important as food and for the oil they contain. They are caught in very large nets. After they are caught, some of the sardines are canned. The oil from the sardines is used to make varnish, paint, margarine, and many toilet preparations. Some of the sardines are dried, pounded into powder, and placed in sacks. This is called *fish meal*, and is used for chicken feed and for fertilizer. In the southern part of France the sardine is preserved in red wine and is served as a delicacy.

The sardine industry is one of the biggest fishing industries of British Columbia and California. Sometimes, however, there are other kinds of fish on the market which are called sardines. These are not actually sardines but are the young fish of herrings, menhaden, and other small fishes. See also **HERRING**.

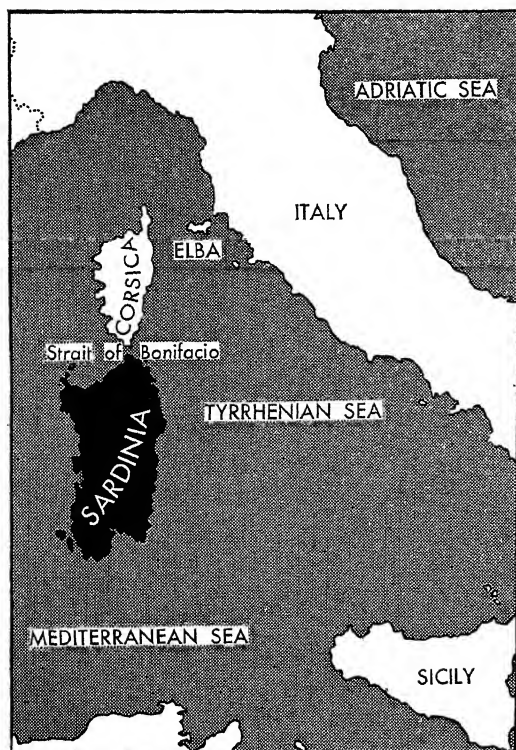
L.P.Sc.

**Classification**. Sardines belong to the family *Clupeidae*. The European sardine is of the species *Clupea pilchardus*. The Pacific Coast species is *Sardinops caerulea*.

**SARDINIA**, *sahr DIN ih ah*, or **SARDEGNA**, *sahr DAnyah*, is an Italian island in the Mediterranean west of the mainland of Italy and over 100 miles distant from it. The land nearest to Sardinia is the French island of Corsica, nine miles to the north across the Strait of Bonifacio. Sardinia is second in size among all of the islands of the Mediterranean. Only Sicily is larger. Sardinia is about 168 miles wide from east to west. It covers an area of 9,301 square miles, and has a population of 1,034,206.

Nine tenths of Sardinia is mountainous. The only important area of lowlands is the plain across the southwestern part of the island. Human settlement in the mountains is difficult because the steep slopes and heavy rainfall produce landslides and floods. Removal of the forests in many places and loss of the soil have made agriculture almost impossible in the mountains. The agricultural improvement of the small areas of level land has been retarded in places by malarial swamps and elsewhere by lack of moisture during the

hot, dry summers. These problems are gradually being overcome by drainage projects and by irrigation. The most important agricultural products are wheat, oranges, lemons, olives, and grapes. Many goats and sheep are raised. Ancient mines in the mountains still



Location Map of Sardinia

5376

produce lead, zinc, silver, and other minerals.

Through the course of history Sardinia has been invaded and ruled by first one power and then another. These have included Carthage, Rome, the Vandals, Byzantium, the Moslems, the city-states of Pisa and Genoa, Aragon, Piedmont, and finally by unified Italy. Sardinia preserves many ancient customs, traditions, and costumes. In the mountains, life still follows the pattern of Roman times.

During World War II, Sardinia became an important airplane and naval base for Fascist Italy. In 1943 American fighter planes smashed two convoys at Sardinia, and destroyed many airfields. American Flying Fortress attacks later damaged more Italian vessels lying in Sardinia's naval base. But the war made little permanent impression on Sardinia.

Sardinia is divided into a northern province of Sassari and a southern province of Cagliari. The chief cities bear these same names. The city of Cagliari is also the capital of the island. Even in these settlements there is very little industry. Most of the products, such as mineral ores, wine, goatskins, olives, and fish, are exported with a minimum of processing or manufacturing.

H.V.B.K., Jr.

See also DRESS (Italy); SARDINIA, KINGDOM OF.

**SARDINIA, KINGDOM OF.** This early Italian king-

dom became the nucleus of united Italy. The kingdom of Sardinia was made up of the islands of Sardinia and Caprera, the principality of Piedmont, the county of Nice, the duchies of Savoy, Aosta, Genoa, and Montferrat, and parts of the old duchy of Milan. The first king of Sardinia was Victor Amadeus I (1666-1732). In 1730 he left the throne in favor of his son, Charles Emmanuel III.

The French invaded Savoy during the French Revolution. Savoy, Nice, and later Piedmont were lost to the French. After Napoleon's downfall, Sardinia won back the conquered territories, and Genoa was added to the prewar kingdom. During the reign of Charles Albert, who came to the throne in 1831, the movement for unifying Italy began. Albert granted the kingdom of Sardinia a new constitution. In 1848 he tried to drive the Austrians out of the Italian lands of Lombardy-Venetia. But in 1849 the Austrians defeated the Sardinians at the battle of Novara, and Charles Albert abdicated in favor of his son, Victor Emmanuel II.

In 1852 Prime Minister Camillo Benso di Cavour undertook to unify the Italian states. A war against Austria in 1859 won Lombardy for the cause of united Italy. Later Modena, Parma, Tuscany, and Romagna joined in the unification movement behind Sardinia. When, due to Giuseppe Garibaldi's expedition, the south was won for the cause, united Italy became a fact. In 1861 the first Italian Parliament met at Turin and proclaimed Victor Emmanuel King of Italy. Sardinia went out of existence as a state and became an administrative part of the new kingdom. Rome, under the rule of the Pope, and Venetia, under Austria, were still outside the kingdom.

J.S.S.

See also CAVOUR, CAMILLO BENSO, COUNT DI; ITALY (History, French Revolution); VICTOR EMMANUEL.

**SARDIS DAM** is one of the largest earth-filled flood-control dams in the United States. It is located on the Little Tallahatchie River, in northwestern Mississippi. Sardis Dam was built chiefly for flood-control purposes, but it also furnishes electric power to Mississippi cities. The dam is 117 feet high, almost a quarter of a mile wide at its base, and 15,300 feet along the top. It controls a volume of 2,500,000,000 cubic yards of water.

Sardis Reservoir, behind the dam, is over 30 miles long. The United States Army Corps of Engineers completed the Sardis Dam in 1940 at a cost of about \$13,300,000. The reservoir includes a pool for conservation development.

See also DAM.

**SARDONYX**, *SAHR doh nicks*, is a form of quartz which is used in rings and other jewelry. It is a variety of agate. Sardonyx is cut from the flat layers of a banded mass of agate. It is found in India, Palestine, Arabia, Brazil, Uruguay, Scotland, and Eire. Sardonyx is one of the cheaper gem stones. It is usually cut flat, convex, or dome-shaped to bring out its full color of brown, golden, or blood red. Sardonyx is one of the birthstones for August. Sardonyx is mentioned as one of the stones in the breastplates of the Israelite high priests (Exod. 28:20). Saint John calls it the fifth of the foundation stones in his description of the Holy City (Rev. 21:20). Much myth and legend of olden days was built around the sardonyx. See also ONYX.

F.H.P.

**SARDOU**, *sahr* DOO, **VICTORIEN** (1831-1908), was one of the most successful French playwrights of his time. His light comedies, such as *Diplomacy* and *A Scrap of Paper*, were popular in both Europe and America for many years. Sardou was a master of the *well-made play*, which emphasized plot rather than thought.

Sardou was born in Paris. He was too poor to finish a course in medicine, and finally tried to support himself by writing. His first attempts at writing plays were unsuccessful. But his dramas finally won him a large fortune and election to the French Academy in 1878. B.H.G.

See also BERNHARDT, SARAH.

**His Works** include *Ragabag*; *Hate*; and *Robespierre*. His *La Tosca* was used as a basis for Giacomo Puccini's opera of the same name.

**SARETT**, *sahr* ET, **LEW** (1888- ), is an American poet, lecturer, and educator. His verse tells of the forests and the mountains, and of the animals and people who live in them. Sarett was born in Chicago. He was graduated from Beloit College in 1911. In 1916 he received a law degree from the University of Illinois, where he taught English and public speaking from 1912 to 1920. In 1921 he became a professor of speech at Northwestern University. E.L.G.

**His Works** include *Many Moons*; *The Box of God*; *Slow Smoke*; *Wings against the Moon*; and *Collected Poems*.

**SARG, TONY** (1882?-1942), was an illustrator and puppet-maker. He was born in Guatemala, the son of a German diplomat. Sarg was educated in Germany. In 1905 he moved to London and began his career as a commercial artist. Sarg came to America in 1914 and soon won fame for his humorous magazine illustrations. His hobby at that time was making puppets, and he often put on puppet shows to amuse his friends. Winthrop Ames gave him money to do a professional puppet show and his puppet companies soon made yearly tours across the United States. Sarg also made many colorful designs for toys, boxes, and interior decoration, and wrote several books for children. P.McP.

**SARGASSO SEA.** No land boundaries of any kind mark off this body of water from the rest of the open ocean. It is set apart by the presence of marine plants, or seaweed, which float on its surface. The Sargasso Sea is an irregular, oval-shaped area of the North Atlantic Ocean, about 2,000 miles west of the Canary Islands. It lies roughly between the 20th and 40th parallels of north latitude, and between the 35th and 75th meridians west of Greenwich. The Sargasso Sea gets its name from the Portuguese word for seaweed. Probably there was some vague knowledge of the sea before the time of Columbus, but he is given credit for the first reliable report on this region. He sounded the sea to make sure that no rocks lay beneath the weeds.



Brown Bros.

**Victorien Sardou** was a popular French dramatist of the late 1800's.

### The Legends of the Sea

The early navigators who sailed their small ships to the New World saw the Sargasso Sea as patches of gulfweed which seemed to form wide-spreading meadows. Soon there were legends and myths about the region, which told of large islands of thickly matted seaweed, inhabited by huge monsters of the deep. Poets and novelists used their imagination in describing the sea. They pictured a blanket of netted seaweed from which no ship could escape, once it became entangled in the weed. Many of the ghost ships of the past were described as huddled together in a weaving, rotting mass. Shapeless hulks of ancient galleons, covered with weeds and barnacles, were pictured lying beneath the waters of this mysterious sea. The passing years contributed skeletons of modern slave ships, then of pirate ships, and later of the gallant ships of Revolutionary War days. Wrecks of smart clipper ships and finally an outer fringe of the latest doomed ships completed the weird legendary collection. Even today, serious publications sometimes state that parts of the Sargasso Sea are so thickly covered with seaweed that ships passing through are greatly hampered.

### The Facts about the Sea

But modern explorers of the ocean have completely changed the picture of the Sargasso Sea. They have shown that the area of this sea is about 2,000,000 square miles and their study has opened up fascinating problems for research.

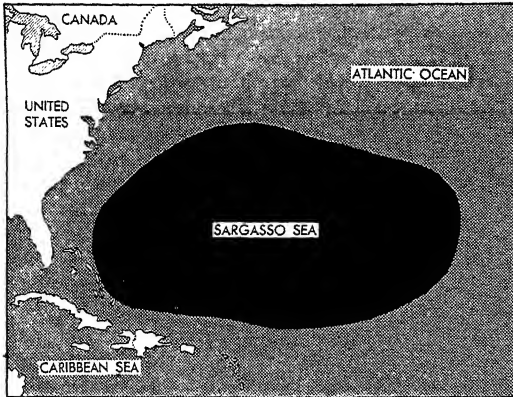
**Origin of the Seaweed.** At first scientists believed



Ewing Galloway

**Tony Sarg's Puppets** delighted thousands of American children and grownups. Most of Sarg's puppets were only about two feet high. But by clever stage lighting and manipulation, Sarg made them appear to be as large as real people.

that the seaweed came from near-by rocks and shoals, or shallow areas. It was later discovered that the depths here were from two to four miles. Scientists then agreed that the seaweed could not have originated from a



Location Map of the Sargasso Sea

source so far beneath the sea. Next it was thought that the seaweed came from the shores of the West Indies and the Bahamas, after it had been torn loose by wind and wave. But the seaweed in the Sargasso Sea does not have the organs of reproduction which are found on the weed that grows along that coast.

The accepted explanation came to be that the seaweed occurs in the Sargasso Sea because the plant has adapted itself to the open sea. The seaweed does not come from coastal regions. It lives and reproduces in the region where it floats on the surface of the water. It is supported by small air sacs which look like tiny grapes, and grow in the weeds.

The greatest quantity of gulfweed is found within the central part of the Sargasso Sea. It occurs in scattered masses, some of which are a hundred feet in diameter. Wind action forms long strips of the weed, which follow the general direction of the wind. While patches of the weed may cover an acre or more, there are no islands of weeds which extend for miles. Nowhere is the region so thickly covered that it interferes with the movements of a ship.

**Waters of the Sea.** The waters of the Sargasso Sea have many distinctive features. The outer boundary of the water is surrounded by great currents, which include the mighty Gulf Stream. The waters that make up the sea are almost motionless. The water is of an unusually deep blue color. It has a high salt content and a high temperature, and is very clear. A white disk, six feet in diameter was once lowered 200 feet below the surface of the sea. The disk could be clearly seen with the naked eye. These features are due mainly to the location of the sea and its great depth, to the absence of islands, and to its great distance from any continents. See also **SEAWEED**.

H.A.M.A.

**SARGENT, DUDLEY ALLEN** (1849-1924). See **PHYSICAL EDUCATION** (Following World War I).

**SARGENT, JOHN SINGER** (1856-1925), was one of the best known artists of his time. His portraits of prominent persons were his most popular works during his lifetime, but many critics now consider the water colors he

painted during his later years his best works. Sargent painted these swiftly, and emphasized his central subject with masterly craftsmanship. Such paintings as the impressionistic "Melon Boats," "White Ships," and "Miss Eliza Wedgwood and Miss Sargent Sketching" illustrate his simplified patterns of light and color.

Sargent was born of American parents in Florence, Italy, and he began to study art there. At the age of eighteen he went to Paris to study under Carolus Duran. Between 1878 and 1884 his paintings were shown in the Paris Salon. After 1884 Sargent lived in London.

M.B.R.

See also **PAINTING** (Great American Painting, color plate, The Wyndham Sisters).

**His Works** include portraits of Carolus Duran, Claude Monet, Edwin Booth, Theodore Roosevelt, John Hay, and Woodrow Wilson; the mural "Hebrew Prophets," in the Boston Public Library; "The Fountain," in the Chicago Art Institute; "Carnation Lily"; "Carmencita"; "The Weavers"; and "Trout Stream in the Tyrol."

**SARGON, SAHR gahn, II** (? -705 B.C.), was king of Assyria from 722 to 705 B.C. He greatly expanded the kingdom by conquest. In 710 B.C. he conquered Babylonia and made himself king of Babylonia. He strengthened his rule by resettling conquered peoples in other parts of his empire. His son Sennacherib followed him. See also **SENNACHERIB**.

**SARGON OF AKKAD.** See **BABYLONIA** (History).

**SARI, SAH ree.** See **DRESS** (India).

**SARK, sahrk,** is one of the Channel Islands, about seventy miles south of England and twenty-two miles off the French coast. The Isle of Sark is over three



Fogg Museum of Art

**John Singer Sargent's Painting of Laura Lister** shows the lifelike style which made him a master portrait artist. He painted many of the most prominent persons of his time, but he was especially fond of painting young ladies. This rather shy child was the daughter of a prominent British nobleman.

miles long and more than a mile and a half wide. It has a population of about 500. Many bays and coves cut into the island coast line. Cliffs rise up from the sea on all sides of the rocky island. German troops occupied Sark in 1940 and held the island during most of World War II.

W.E.E.

**SARMIENTO**, *sahr MYEN toh*, **DOMINGO FAUSTINO** (1811-1888). See ARGENTINA (Social and Cultural Achievements [Education]); LATIN-AMERICAN CULTURE (Education).

**SARNOFF**, *SAHR nauhf*, **DAVID** (1891- ), was one of the first American radio executives to see the full



**David Sarnoff**, pioneer American radio producer

possibilities of using radio for entertainment. As president of the Radio Corporation of America from 1930, he also was a pioneer in television. Sarnoff was born in Minsk, Russia, and came to the United States in 1900. In 1906 he learned the Morse code while working as a messenger boy for the Commercial Cable Company, and later became a wireless operator for the Marconi Wireless Telegraph Company. He operated various stations for the company and in the meantime studied electrical engineering at Pratt Institute. By 1917 he was commercial manager of the Marconi Company, which the Radio Corporation of America took over two years later.

G.S.B.

**SARONG**, *sah RAWNG*. See DRESS (Java).

**SAROYAN**, *sah ROH yahn*, **WILLIAM** (1908- ), is one of the most colorful of modern American writers.

His carefree manner of living and his boastful comments on his own ability have attracted almost as much attention as his writings. His works include short stories, novels, and plays. His style is loose but pleasantly rhythmic, and the structure of his stories and plays is rather formless. The occasional sentimentality of his writing is lightened by genuine humor and sympathetic understanding of human nature.



Schaal, Pix

Saroyan was born in Fresno, Calif., the son of Armenian immigrants. He received little formal education. He gained immediate fame in 1934 with the publication of his short story "The Daring Young Man on the Flying Trapeze." His play *The Time of Your Life* won the Pulitzer prize for drama in 1940, but Saroyan refused the award. His book *The Human Comedy* was made into a successful motion picture. Saroyan served as a soldier in World War II. *The Adventures of Wesley*

**William Saroyan** wrote some of the most-discussed works in modern American literature.

*Jackson* was a novel based on his war experiences. L.J.

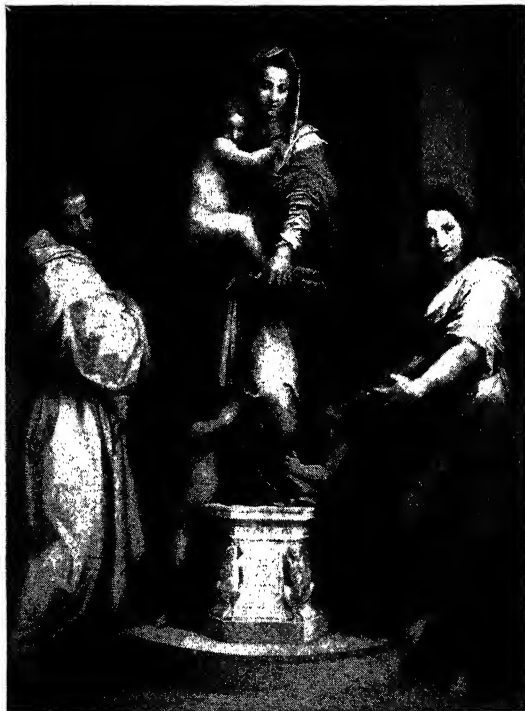
See also PULITZER PRIZES.

**His Works** include *Inhale and Exhale*; *Three Times Three*; *My Name is Aram*; and the plays *My Heart's in the Highlands* and *Love's Old Sweet Song*.

**SARSAPARILLA**, *SAHR sah pah RIL ah*, is a drug which comes from the dried roots of several kinds of similar plants that grow in Central and South America and Mexico. The roots are several feet long, and about as thick as a goose quill. The drug will not cure anything, but it was once widely used as a spring tonic and as an "alternative" in the treatment of syphilis. An alternative is supposed to help co-ordinate the body's activities again, and to help the processes of repair. Sarsaparilla was used sometimes as a flavoring for soft drinks. It no longer has any commercial value as a "patent" medicine, but is still used to flavor medicine. See also SMILAX. A.E.S.

**SARTO**, **ANDREA DEL** (1486-1531), was a famous Florentine painter of the Italian High Renaissance. He was one of the finest colorists of his time. His technique was so good that he was called the "Faultless Painter." His real name was Andrea d'Agnolo, but he was nicknamed Del Sarto, which means "the tailor's son," because his father was a tailor.

Del Sarto was born in Florence and was at first ap-



Erich S. Herrmann

**Andrea Del Sarto's "Madonna of the Harpies"** was painted in 1517. The painting takes its name from the six figures called harpies, which adorn the corners of the pedestal.

prenticed to a goldsmith, but he soon became interested in painting and studied under Piero di Cosimo. In 1508 Del Sarto entered the painter's guild. s.c.

**His Works** include "Madonna of the Sack"; "The Last Supper"; and "Madonna of the Harpies."

**SARTO**, *SAHR toh*, **GIUSEPPE**. See PIUS (X).



# ASKATCHEWAN



International Harvester

**SASKATCHEWAN** is the central Prairie Province of Canada. The province takes its name from the Indian word for a great river which winds through the southern plains. The Indians called the river *Kisiskadjewan*, meaning *river-that-turns-around-when-it-runs*, because of its many swift, foaming rapids. The early white settlers made the Indian name easier to pronounce, and called both the river and the countryside Saskatchewan.

The province is best known for its prairies. These are gently rolling plains, covered in summer with grasses and the blood-red prairie lily, which is the province flower. There are many rivers and streams on the prairies, and hundreds of small, wooded lakes which attract ducks, geese, and loons.

Not all of Saskatchewan is prairie, however. North of the open plain lie the park lands. Here the grassland is broken by patches of beautiful woodlands and long chains of sparkling lakes. Still farther north there are dense forests, roamed by deer, moose, caribou, and many smaller animals. Some of these animals have valuable fur.

Most of the people of Saskatchewan owe their living to the fertile land. Seven of every ten persons are engaged in farming or ranching. On the southern prairies, great seas of grain wave over more than twenty million acres of farm land during the growing season. This is the land of the "wheat kings." Farmers here have won world prizes for their fine grain. Saskatchewan is sometimes called CANADA'S BREAD BASKET because it is

first among the provinces in the production of wheat.

Thousands of cattle, sheep, and horses graze in the open spaces of the Saskatchewan Park Lands. This region is one of the last open-range cattle countries of the Canadian West. Saskatchewan ranks second among the provinces in the value of its slaughtering and meat-packing products.

The mines of northern Saskatchewan yield vast quantities of gold, silver, copper, zinc, and pitchblende, which is the source of the world's most precious mineral, radium, and uranium, a source of atomic energy. Much of the mineral wealth of the province is as yet undeveloped.

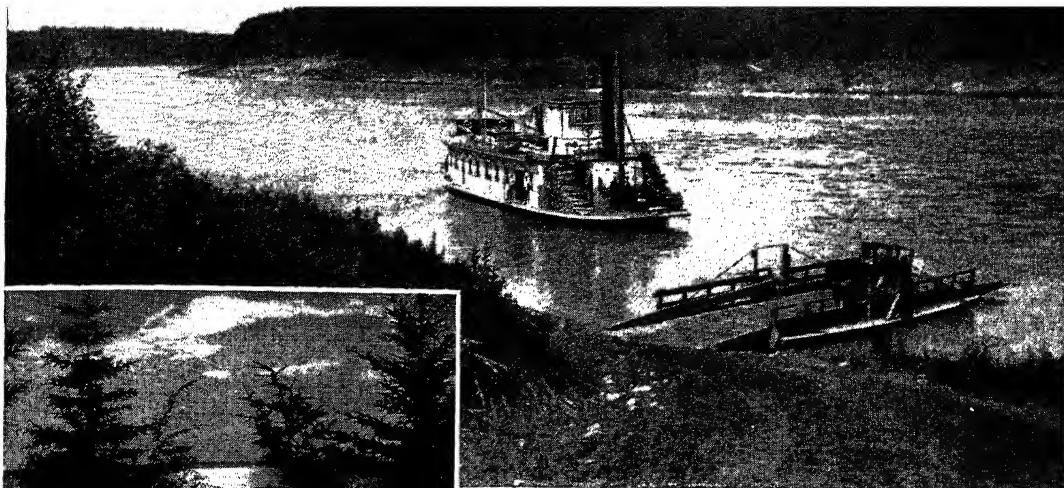
## The Land and Its Resources

**Extent:** Area, 251,700 square miles (13,725 square miles of which are inland water), fifth in size among the provinces. *Greatest length*, 760 miles; *greatest width*, 393 miles.

**Physical Features:** *Elevation*, highest, Cypress Hills, 4,546 feet above sea level; lowest, sea level in the Saskatchewan River Valley near Cumberland Lake. *Chief rivers*, Assiniboine (and chief tributary, Souris), Beaver, Churchill, Fond du Lac, Qu'Appelle, Saskatchewan

## Pronunciation Guide

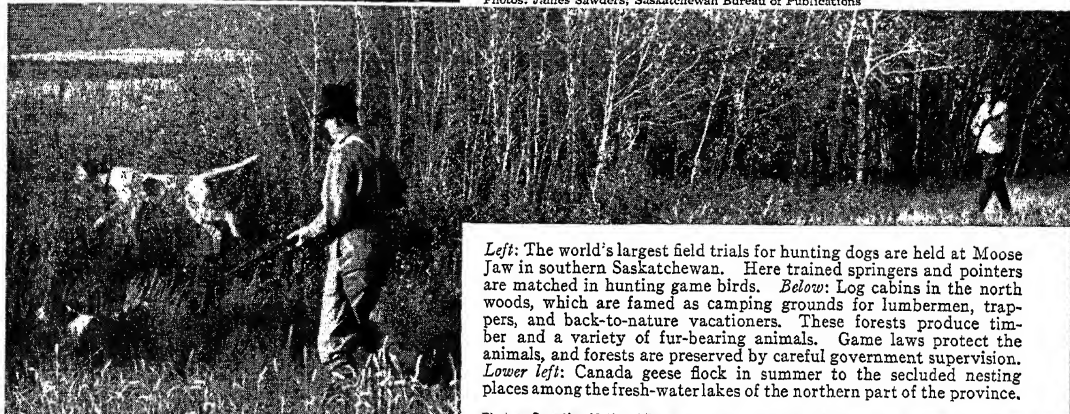
Dafore <i>dah</i> FAWR	Lac la Ronge
Dore <i>daur</i>	LAHK lah RAWNZH
Fond du Lac FAHN doo LACK	Qu'Appelle kah PEI
Lac la Plonge	Wapawekka
LAHK lah PLAWNZH	wahp ah WECK kah



### SCENIC LAKES AND RIVERS

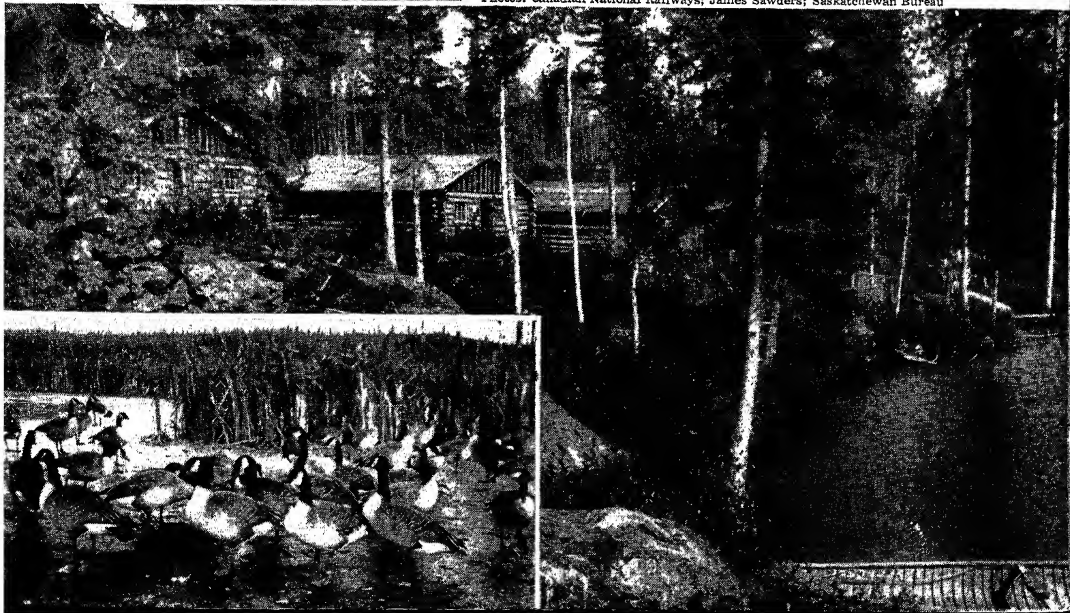
*Above:* A steamboat on the Saskatchewan River. Lumber to fuel the engines of this stern-wheeler is piled neatly on the deck. *Left:* Lake Waskesiu, in Prince Albert National Park, one of the thousands of beautiful lakes, teeming with fish, that dot the northern part of the province, helping to make it an attractive vacation land for many.

Photos: James Sawders; Saskatchewan Bureau of Publications



*Left:* The world's largest field trials for hunting dogs are held at Moose Jaw in southern Saskatchewan. Here trained springers and pointers are matched in hunting game birds. *Below:* Log cabins in the north woods, which are famed as camping grounds for lumbermen, trappers, and back-to-nature vacationers. These forests produce timber and a variety of fur-bearing animals. Game laws protect the animals, and forests are preserved by careful government supervision. *Lower left:* Canada geese flock in summer to the secluded nesting places among the fresh-water lakes of the northern part of the province.

Photos: Canadian National Railways; James Sawders; Saskatchewan Bureau



(and chief tributaries, North Saskatchewan and South Saskatchewan), Waterhen. *Chief lakes*, Athabaska (partly in Alberta), Churchill, Cumberland, Dore, La Plonge, La Ronge, Peter Pond, Quill, Reindeer, Wapawekka, Wollaston.

**Climate:** *Average temperatures*, ranging from 20° F. to -20° in January, and from 60° to 85° in July. *Precipitation*, averaging from 15 to 18 inches a year. *Snowfall*, ranging from 30 inches yearly in the south to 50 inches in the north.

**Location, Size, and Surface Features.** Saskatchewan lies in the heart of the prairie region of western Canada. On the east and west are Manitoba and Alberta, the other Prairie Provinces. For the boundaries of Saskatchewan, see the colored map.

Saskatchewan is larger than any country in Europe except the Soviet Union. The area of the province is twice that of the British Isles, and slightly larger than Montana and North Dakota put together.

There are three natural regions in Saskatchewan, the Prairie Region, the Park Lands, and the Forest Region.

The *Prairie Region* is gently rolling land covered with grasses and low bushes. There are few trees, except in the river valleys and around the many lakes. The soil is black and rich. The great wheat belt of Saskatchewan lies within this region.

The *Park Lands* lie north of the open prairie. This region is partly plain and partly woodland. The level surface is broken by occasional bluffs, or steep banks, along the rivers. The open areas of the region are suitable for farming and for the grazing of cattle. The woodlands contain many lovely lakes.

The *Forest Region* extends over the northern half of the province. Poplar and birch trees grow on the high lands, and spruce, hemlock, and fir trees cover the lower levels. The region is part of the rocky Laurentian Plateau that covers most of northern Canada. The soil contains deposits of valuable minerals.

**Rivers and Lakes.** The Saskatchewan River supplies the principal drainage system of southern Saskatchewan. The North Saskatchewan and the South Saskatchewan enter the province from Alberta, and join near Prince Albert. The main river then flows east through Manitoba to empty into Lake Winnipeg. The Qu'Appelle and the Assiniboine rivers also drain the southern part of Saskatchewan. The Churchill River and its tributaries drain the northern part of the province. The principal lakes in this region are Reindeer Lake, Lac (Lake) la Ronge, Lac la Plonge, and Mont-real, Dore, and Peter Pond lakes. In the far north is the Fond du Lac River, which flows eastward from the Saskatchewan end of Lake Athabaska to Wollaston Lake.

**Climate.** The winters of the province are cold but sunny. The air is dry and healthful. In the southeastern

part of Saskatchewan winter temperatures often rise suddenly as much as twenty degrees because of warm Chinook winds which sweep down from the Rocky Mountains in southern Alberta. See CHINOOK.

Summer is mild and sunny. Although three fourths of the rainfall comes during the growing season, there are more than 2,200 hours of sunshine in an average year in Saskatchewan.

**Natural Resources.** The soil of Saskatchewan contains an unusually high amount of nitrogen. This quality of the soil produces abundant crops, and makes the farm lands of the province its most valuable resource.

There are about 82,160 square miles of forest in the northern part of Saskatchewan. About half of this area contains trees valuable as lumber. The open country of the Park Lands and the Prairie Region is covered with grasses, wild flowers, and berry bushes.

In the forests there are many fur-bearing animals, including the bear, wolf, mink, otter, fox, and muskrat. Elk, moose, and deer are common in the far north. Antelopes roam the Park Lands. In summer the lakes are the nesting places of many kinds of wild birds. The rivers and lakes contain whitefish, pike, pickerel, and trout.

Mineral deposits are found along the shores of nearly all the large lakes of northern Saskatchewan. The principal metal ores in this area include gold, silver, copper, zinc, lead, iron, nickel, and platinum. Soft-coal veins are common on the southern prairies. Limestone, pottery clays, and petroleum are found in many parts of the province. Pitchblende, which yields radium and uranium, is found in the vicinity of Lake Athabaska.

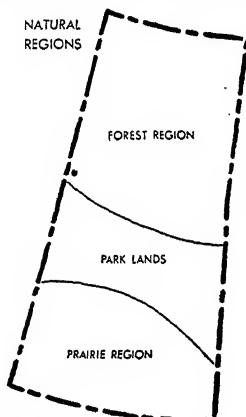
**Conservation and Development** of natural resources are among the chief activities of the provincial government. The province has set aside sixteen forest preserves with a total area of 10,223 square miles. A fire-protection patrol is maintained in all the forests. Game, fish, and birds are protected by hunting and fishing regulations. The province also maintains fish hatcheries at Qu'Appelle.

The provincial government has developed several water-power projects which provide electric power and light for industries and communities. These projects are administered by the Saskatchewan Power Commission.

### The People and Their Work

**Population:** 895,992 (1941), ranking third among the provinces. *Density*, 3.77 persons per square mile, ranking sixth. *Distribution*, rural, 67.06 per cent; urban, 32.94 per cent. *Largest cities*, Regina (58,245), Saskatoon (43,027), Moose Jaw (20,753). For population of other places, see back of colored map.

**Chief Products:** *Agricultural*, wheat, cattle and dairy products, oats, barley, rye, alfalfa, hay, flax, sheep, hogs, horses, poultry and eggs, vegetables (especially potatoes, turnips, beets, beans, and peas), fruits (especially apples, cherries, and plums), honey, wool. *Mineral*, copper, zinc, gold, coal, nickel, silver, iron, lead, pitchblende, platinum, limestone, clay, petroleum. *Manufactured*, flour and feed, slaughtering and meat packing, printing and publishing, butter and cheese, petroleum products, lumber and wood products, cement and brick, iron and steel products. *Furs*, badger, bear, beaver, coyote, lynx, marten, mink, muskrat, otter, skunk, wolf, wolverine. *Fishes*, pickerel, pike, tullibee, ling, sturgeon, bass, and trout.

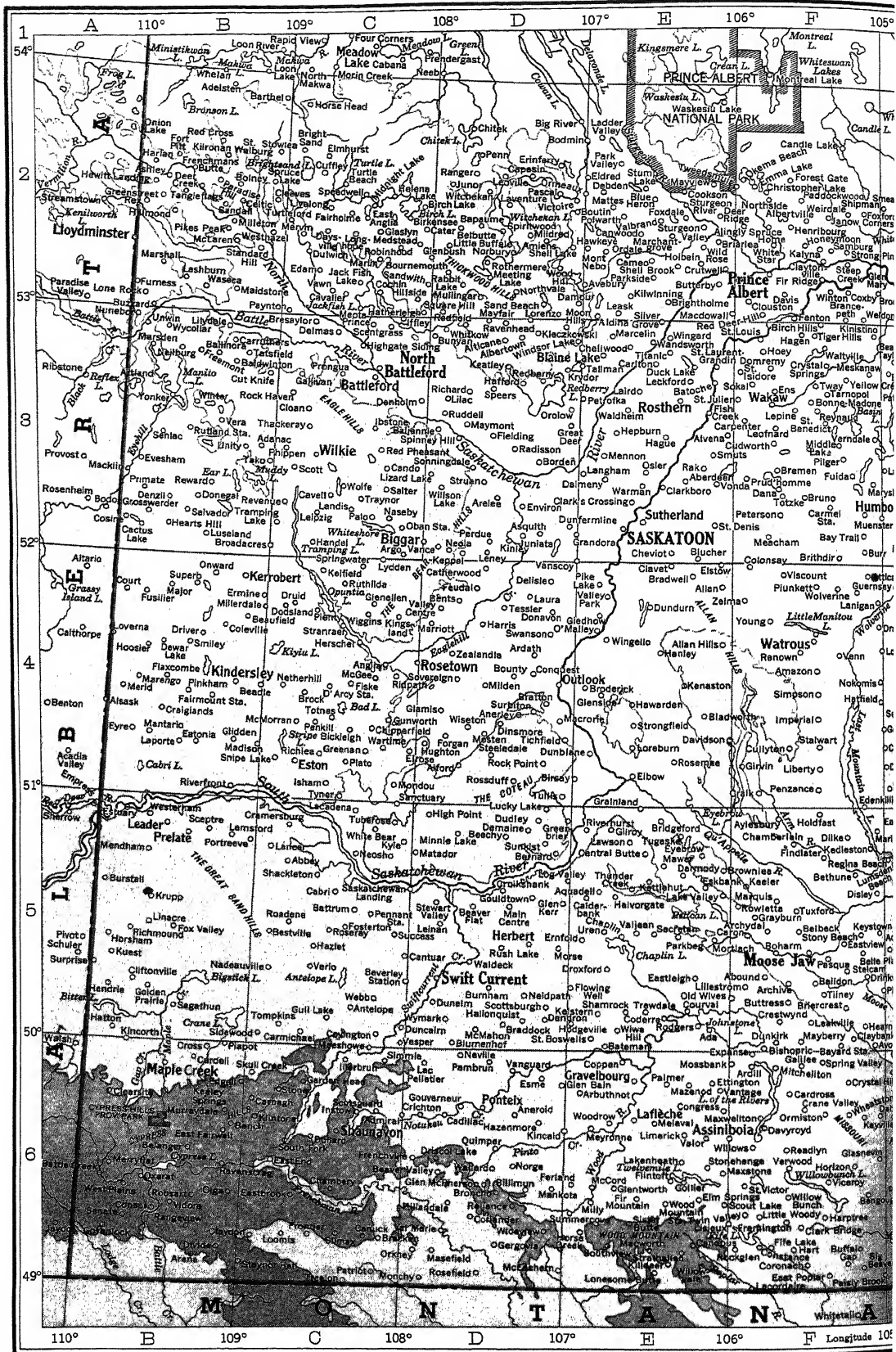


# SASKATCHEWAN

Total Population 895,992

Abbey, (C5).....	229	Borden, (D3).....	166	Courval, (E5).....	106	Eston, (C4).....	726	Halbrite, (H6).....	105
Aberdeen, (E3).....	231	Bounty, (D4).....	104	Covington, (C5).....	106	Estuary, (B5).....	98	Hallonquist, (D5).....	101
Abernethy, (H5).....	271	Bournemouth, (C2).....	16	Craiglands, (B4).....	16	Ethelton, (C3).....	110	Handel, (C3).....	113
Adanac, (B3).....	76	Bracken, (C6).....	112	Craik, (F4).....	429	Ettington, (F6).....	19	Handsforth, (J6).....	380
Admiral, (C6).....	180	Bradwell, (E4).....	108	Crane Valley, (F6).....	97	Evesham, (B3).....	91	Hardy, (E4).....	80
Adameda, (J6).....	234	Brancepath, (F2).....	100	Craven, (G5).....	144	Expanse, (F6).....	76	Harpree, (F6).....	237
Albertown, (D3).....	18	Bratton, (D4).....	38	Creelman, (H6).....	145	Eyebrow, (E5).....	161	Hart, (F6).....	15
Albertville, (F2).....	40	Bredenburg, (K5).....	326	Crescent Lake, (J4).....	59	Fairholme, (C2).....	102	Hassan, (J4).....	12
Alford, (D4).....	116	Bremen, (F3).....	19	Crestwynd, (F5).....	150	Fairlight Station, (K6).....	125	Hatfield, (F4).....	92
Alida, (K6).....	382	Bridgeford, (E5).....	39	Crichton, (D6).....	162	Fairmount Station, (B4).....	184	Hawarden, (E4).....	42
Alingly, (E2).....	382	Briercrest, (F5).....	174	Crooked River, (H3).....	535	Fairy Glen, (G2).....	173	Hazel Dell, (H4).....	225
Allan, (E4).....	89	Bright Sand, (C2).....	30	Cruikshank, (D5).....	15	Fairy Hill, (G5).....	70	Hazenmore, (D6).....	62
Alpha, (H5).....	222	Broadacres, (B3).....	894	Crystal Springs, (F3).....	111	Fenwood, (H4).....	111	Hazlet, (C5).....	286
Alticane, (D3).....	101	Brook, (C4).....	163	Cudworth, (F3).....	108	Feudal, (D4).....	118	Hearne, (F5).....	875
Alvena, (E3).....	128	Brookington, (G2).....	114	Cullen, (J6).....	88	Fielding, (D3).....	113	Hepburn, (E3).....	137
Amazon, (F4).....	89	Broderick, (E4).....	133	Cumberland House, (J2).....	399	Fife Lake, (F6).....	118	Heward, (H6).....	105
Amiens, (D2).....	66	Brombury, (H4).....	104	Cupar, (G5).....	299	Fillmore, (H6).....	118	Hirsch, (J6).....	61
Amulet, (G6).....	32	Bromhead, (H6).....	118	Cut Knife, (B3).....	299	Findlater, (F5).....	118	Hitchcock, (J6).....	223
Anerley, (D4).....	279	Broncho, (D6).....	140	Dafoc, (C4).....	108	Fir Mountain, (E6).....	14	Hodgeville, (E5).....	165
Aneroid, (D6).....	66	Brooksby, (C2).....	57	Dahinda, (C6).....	88	Fish Creek, (E3).....	113	Hofier, (H6).....	24
Anglia, (C4).....	17	Browning, (J6).....	104	Dalmeny, (E3).....	198	Fishing Lake, (H4).....	113	Holbein, (E2).....	263
Annaheim, (G3).....	96	Brownlee, (F5).....	543	Dana, (F3).....	53	Fiske, (C4).....	29	Hoosier, (B4).....	66
Antelope, (C5).....	133	Bruno, (F3).....	19	D'Arcy Station, (C4).....	456	Fitzmaurice, (H4).....	109	Horizon, (F6).....	168
Antler, (K6).....	362	Buchanan, (J4).....	77	Darmody, (E5).....	83	Flaxcombe, (B4).....	65	Horse Creek, (E6).....	547
Aquadell, (E5).....	204	Buffalo Gap, (F6).....	138	Davin, (G5).....	20	Fleming, (E6).....	557	Hubbard, (H4).....	141
Arabella, (K3).....	563	Bulyea, (G4).....	207	Davis, (F2).....	184	Flintoft, (K5).....	55	Hudson Bay Junction, (J3).....	141
Arbfield, (H2).....	80	Burnstall, (B5).....	12	Daylesford, (G3).....	333	Fond du Lac, (H4).....	80	Humboldt, (F3).....	1,767
Archerhill, (H3).....	80	Buzzard, (A2).....	439	Debden, (E2).....	100	Forgand, (D4).....	148	Huntoon, (H6).....	40
Arcola, (J6).....	145	Cabri, (C5).....	196	Delisle, (D4).....	95	Forget, (J6).....	152	Huras, (J4).....	146
Ardath, (D4).....	83	Cactus Lake, (B3).....	45	Delmas, (C3).....	138	Fort Qu'Appelle, (H5).....	673	Illerbrun, (C6).....	320
Ardill, (F6).....	212	Cadillac, (D6).....	226	Denholm, (C3).....	207	Forward, (G6).....	32	Imperial, (F4).....	1,349
Areeley, (D3).....	51	Calder, (K4).....	16	Denzil, (B3).....	51	Fosston, (H3).....	130	Inchkeith, (J5).....	1,349
Armley, (G2).....	296	Cameo, (E2).....	50	Dewar Lake, (B4).....	215	Fosterton, (C5).....	92	Indian Head, (H5).....	1,349
Arran, (K4).....	122	Candiac Station, (H5).....	50	Dilke, (F5).....	67	Four Corners, (C1).....	92	Innes, (H6).....	123
Artland, (B3).....	238	Candle Lake, (F2).....	80	Dinsmore, (D4).....	11	Foxford, (F2).....	423	Inslow, (C6).....	207
Assiniboia, (E6).....	1,349	Cando, (C3).....	80	Disley, (F5).....	241	Fox Valley, (B5).....	148	Invermay, (J4).....	11
Atwater, (J5).....	296	Canora, (J4).....	1,200	Dnieper, (K4).....	11	Francis, (H5).....	34	Ituna, (H4).....	406
Ayonlea, (F5).....	15	Cantuar, (D5).....	54	Dodsland, (C4).....	147	Freemont, (B3).....	127	Jack Fish Lake, (C2).....	181
Aylsham, (H2).....	397	Cantuar, (D5).....	54	Dolland, (C6).....	203	Frenchmans Butte, (E2).....	175	Jameson, (G5).....	97
Bagley, (G2).....	170	Canwood, (C6).....	232	Domremy, (F3).....	60	Frenchville, (C6).....	142	Jansen, (G4).....	50
Balgarnes, (H5).....	42	Canwick, (E2).....	200	Donavon, (D4).....	44	Frontier, (C6).....	51	Jasmin, (H4).....	34
Balgownie, (C5).....	120	Carrievale, (K6).....	86	Donwell, (J4).....	185	Froude, (H6).....	69	Jedburgh, (J4).....	34
Balfennie, (G3).....	46	Carlton, (E3).....	98	Doonside, (K6).....	173	Frys, (K6).....	43	Junior, (D2).....	1,792
Bangor, (J5).....	33	Carmel Station, (F3).....	83	Douglaston, (J6).....	21	Fulda, (F3).....	66	Kamsack, (K4).....	101
Bankend, (H4).....	39	Carmichael, (C5).....	384	Drake, (G4).....	63	Furness, (B2).....	185	Kandahar, (G4).....	79
Bannock, (H3).....	155	Carnduff, (K6).....	164	Drinkwater, (F5).....	190	Fuslier, (B4).....	289	Kayville, (F6).....	84
Bapaume, (D2).....	181	Caron, (F5).....	19	Driver, (B4).....	551	Gainsborough, (K6).....	16	Kealey Springs, (B6).....	25
Barford, (H3).....	110	Carpenter, (F3).....	48	Druid, (C4).....	94	Gallie, (F6).....	105	Kelley, (F5).....	43
Barham, (E5).....	62	Carrington, (H2).....	87	Dubac, (J5).....	23	Gallivan, (C3).....	78	Kelley, (F5).....	60
Batoche, (E3).....	1,317	Carro River, (H2).....	25	Duck Lake, (E3).....	41	Garrick, (G2).....	13	Kelley, (F5).....	348
Battleford, (C3).....	29	Carrother, (B3).....	37	Dudley, (D5).....	150	Gerald, (K5).....	100	Kelley, (F5).....	80
Batturum, (C5).....	10	Cavallier, (C2).....	75	Duff, (H5).....	136	Gibbs, (G5).....	93	Kelso Station, (K6).....	98
Bay Trail, (F3).....	62	Cavell, (C3).....	251	Dulwich, (C2).....	40	Gilroy, (E5).....	276	Kelvington, (H3).....	615
Bear Creek, (K5).....	110	Cedoux, (H6).....	257	Dumas, (J6).....	136	Girvin, (F4).....	267	Kenaston, (E4).....	239
Beatty, (G3).....	13	Central Butte, (E5).....	114	Dummer, (G6).....	344	Gladmar, (C6).....	121	Kendal Station, (H5).....	125
Beaufield, (C4).....	20	Ceylon Station, (G6).....	165	Dunblaine, (D4).....	62	Glamis, (D4).....	88	Kennedy, (J5).....	237
Beaver Valley, (D6).....	193	Chamberlain, (F5).....	135	Dunclair, (D5).....	15	Glaslyn, (C2).....	180	Kenosee Park, (J6).....	48
Bechar, (G5).....	22	Chaplin, (E5).....	303	Dundurn, (E4).....	243	Glen Adelaide, (J6).....	84	Keppel, (D3).....	588
Beckenham, (H4).....	69	Chelan, (H3).....	199	Dunkirk, (F5).....	212	Glen Bain, (E6).....	76	Ketchen, (J3).....	41
Bedfordville, (H4).....	43	Chiteck, (D2).....	100	Dunleath, (K4).....	542	Glen Bush, (D2).....	153	Kettlehut, (E5).....	97
Beechy, (D5).....	279	Chocicland, (C2).....	12	Duval, (G4).....	89	Glen Ewen, (K6).....	109	Keystone, (F5).....	103
Belbutte, (D2).....	125	Christopher Lake, (F2).....	68	Dysart, (H5).....	179	Glen Mary, (F2).....	102	Killaly, (J5).....	168
Belle Plaine, (F5).....	69	Churchbridge, (J5).....	100	Earl Grey, (C5).....	136	Glen Mery, (F2).....	92	Kincaid, (D6).....	259
Bender, (J5).....	210	Clair, (G3).....	21	East End, (C6).....	83	Glenside, (E4).....	136	Kindersley, (B4).....	990
Bengough, (F6).....	39	Clarkboro, (E3).....	40	Eatonia, (B4).....	208	Glenworth, (E6).....	126	Kinley, (D3).....	85
Benson, (J6).....	1,930	Clark Bridge, (F6).....	104	Ebenezer, (J4).....	95	Glidden, (H4).....	1,130	Kinistino, (F3).....	564
Bents, (D4).....	507	Clashmoor, (H3).....	47	Edam, (C2).....	253	Golburn, (B3).....	94	Kinloch, (H3).....	321
Bergfield, (G6).....	384	Clavet, (E4).....	20	Edenwold, (G5).....	126	Golden Prairie, (B5).....	115	Kipling Station, (J5).....	271
Bernard, (D5).....	210	Claydon, (B6).....	104	Edfield, (H4).....	83	Goldfields, (L2).....	115	Kisbey, (J6).....	76
Berville, (C5).....	210	Cleaves, (C2).....	47	Edgeley, (H5).....	208	Goodeve, (H4).....	88	Krupp, (B5).....	134
Bethune, (F5).....	39	Clemens, (G3).....	243	Edgeworth, (G6).....	95	Goodsoil, (L4).....	175	Kuroki, (H4).....	123
Beverly Station, (C5).....	618	Cliftonville, (B5).....	36	Elbow, (E4).....	289	Goodwater, (H6).....	175	Kyle, (C5).....	20
Bickleigh, (C4).....	513	Climax, (C6).....	224	Eldred, (E2).....	253	Gouverneur, (D6).....	836	Kylemore, (H4).....	3
Bienfait, (J6).....	1,930	Cloan, (H3).....	191	Ellisboro, (H5).....	155	Govan, (C4).....	36		
Big Beaver, (F6).....	507	Cochin, (C2).....	100	Ellisburg, (C2).....	126	Govenlock, (B6).....	115		
Biggar, (C3).....	384	Coderre, (H2).....	79	Elrose, (D4).....	83	Grand Coulee, (G5).....	115		
Big Muddy, (G6).....	210	Coderre, (H2).....	100	Elstow, (E4).....	155	Grand Coulee, (G5).....	115		
Big River, (D2).....	507	Coleville, (B4).....	100	Emma Lake, (F2).....	126	Gravelbourg, (E6).....	1,130		
Birch Hills, (F3).....	384	Colfax, (H6).....	86	Endeavour, (J3).....	155	Gray, (G5).....	94		
Birch Lake, (D2).....	28	Colgate, (H6).....	183	Englefield, (G3).....	155	Grayson, (J5).....	281		
Birmingham, (H5).....	98	Colonsay, (F3).....	64	Enid, (H4).....	17	Greenstreet, (A2).....	28		
Birsay, (D4).....	111	Congress, (E6).....	240	Enviro, (D3).....	11	Grenfell, (G5).....	857		
Bishopric, (F5).....	69	Conquest, (D4).....	117	Erinferry, (D2).....	142	Griffin, (G2).....	139		
Biorkdale, (H3).....	136	Constance, (F6).....	53	Ermine, (B4).....	123	Gronlid, (G2).....	295		
Bladworth, (E4).....	561	Consul, (B6).....	53	Ernfold, (D5).....	60	Grove Park, (J5).....	115		
Blaine Lake, (D3).....	53	Cookson, (E2).....	52	Erwood, (K3).....	36	Guernsey, (F4).....	836		
Blucher, (E3).....	121	Copeau, (H3).....	53	Esk, (G4).....	2,774	Gull Lake, (C5).....	36		
Blue Bell, (L4).....	55	Coppen, (E6).....	122	Eskbank, (E5).....	431	Gunworth, (C4).....	342		
Blumenhof, (D5).....	139	Corinne, (G5).....	139	Estevan, (J6).....	75	Hafford, (D3).....	59		
Bodmin, (D2).....	139	Corning, (J6).....	139	Estlin, (C5).....	75	Hagen, (F3).....	261		
Boharm, (F5).....	139	Coronach, (F6).....	139			Hague, (E3).....	261		
Booth, (G4).....	139								









# SASKATCHEWAN

Total Population 895,992

Lacadena, (C5).....	132	Meota, (C2).....	224	Perigord, (H3).....	27	Sandwich, (C2).....	22	Traynor, (C3).....	74
Lac Vert, (G3).....	133	Merid, (B4).....	35	Peterson, (F3).....	57	Saskatchewan.....		Tregarva, (G5).....	45
Lady Lake, (J3).....	25	Mervin, (C2).....	196	Phippen, (C3).....	52	Landing, (C5).....		Tribune, (H6).....	82
Lefleche, (E6).....	483	Meskanaw, (F3).....	98	Piapot, (B6).....	240	Saskatoon, (E3).....	43,027	Trossachs, (G6).....	245
Laird, (E3).....	284	Meyronne, (E6).....	259	Pilger, (F3).....	160	Sceptre, (B5).....	162	Truax, (G6).....	110
Lajord, (C5).....	106	Middle, (H6).....	227	Pilot Butte, (G5).....	120	Scotsguard, (C6).....	170	Tubrose, (C5).....	50
Lake Alma, (G6).....	99	Middle Lake, (F3).....	171	Pinkham, (B4).....	63	Scott, (C3).....	258	Tuffnell, (H4).....	63
Lake Lenore, (C3).....	240	Mikado, (J4).....	104	Pinto, (J6).....		Scout Lake, (F6).....	100	Tupaske, (E5).....	197
Lake Valley, (E5).....	77	Milden, (D4).....	211	Plato, (C4).....	119	Scrip, (G3).....	10	Tullis, (D4).....	19
Lampman, (J6).....	199	Mildred, (D2).....	78	Pleasantdale, (C3).....	166	Secretan, (E5).....	49	Turtford, (B2).....	275
Lancer, (C5).....	153	Milestone, (C5).....	379	Plenty, (C4).....	178	Sedley, (H5).....	171	Tuxford, (F5).....	105
Lang, (G6).....	309	Millerdale, (B4).....	17	Plunkett, (F4).....	88	Semans, (G4).....	350	Tway, (F3).....	50
Langbank, (J5).....	88	Minton, (C6).....	109	Ponteix, (D6).....	545	Senate, (B6).....	48	Tweedsmuir, (E2).....	16
Langenburg, (K5).....	359	Mistatim, (H3).....	160	Pontrilas, (H2).....	87	Senlac, (B3).....	129	Tyvan, (H5).....	109
Langham, (E3).....	318	Mitchellton, (F6).....	54	Poplar Bluff, (K4).....		Shackleton, (C5).....	114	Unity, (B3).....	682
Langigan, (B4).....	350	Moffat, (H5).....		Poplar Grove, (J5).....		Shamrock, (E5).....	92	Unwin, (B3).....	31
Laporte, (F4).....	105	Montmartre, (H5).....	290	Porcupine Plain, (H3).....		Shaunavon, (C6).....	1,603	Valley Centre, (D4).....	77
Lashburn, (B2).....	358	Mont Nebo, (E2).....	61	Portreeve, (B5).....	206	Sheho, (H4).....	278	Val Marie, (D6).....	306
Laura, (D4).....	88	Montreal Lake, (F1).....		Portreeve, (B5).....	100	Shell Brook, (E2).....	489	Valor, (E6).....	50
Laventure, (D2).....	30	Moose Jaw, (F5).....	20,753	Prairie River, (H3).....	81	Shell Lake, (D2).....	132	Valparaiso, (G3).....	110
Lawson, (E5).....	117	Moose Range, (H2).....	47	Preceville, (J4).....	434	Shipman, (F2).....		Vanguard, (D5).....	259
Leacross, (H2).....	60	Moomsin, (K5).....	1,096	Prelate, (B5).....	554	Sidewood, (B5).....	31	Vanscoy, (D4).....	117
Leader, (B5).....	641	Morse, (D5).....	373	Primate, (B3).....	123	Silton, (G5).....	88	Vantage, (F6).....	70
Leask, (E2).....	251	Mortlach, (E5).....	238	Prince, (C3).....	32	Silver Park, (G3).....	29	Vawn, (C2).....	59
Lebrat, (H5).....	274	Mossbank, (E6).....	606	Prince Albert, (F2).....	12,508	Simmie, (C6).....	115	Veillardville, (J3).....	29
Leipzig, (C3).....	105	Mosten, (D4).....		Pronqua, (C3).....	15	Simpson, (F4).....	206	Venn, (F4).....	51
Lemberg, (H5).....	426	Mount Green, (H6).....		Prudhomme, (F3).....	237	Sintaluta, (H5).....	334	Vera, (B3).....	15
Lemford, (B5).....	57	Mozart, (G4).....	59	Punnichy, (G4).....	252	Sinnett, (G4).....	11	Verigin, (J4).....	298
Leney, (D3).....	83	Mud Lake, (L4).....		Qu'Appelle, (H5).....	584	Skull Creek, (C6).....		Verlo, (C5).....	125
Leoville, (D2).....	128	Muenster, (F3).....		Quill Lake, (C3).....	350	Smeaton, (G2).....	200	Verwood, (F6).....	186
Leross, (H4).....	73	Murraydale, (B6).....		Quinton, (G4).....	161	Smiley, (B4).....	104	Vivank, (H5).....	261
Leroy, (G4).....	200	Naicam, (G3).....	279	Rabbit Lake, (D2).....	172	Snowden, (G2).....	199	Viceroy, (F6).....	203
Leslie Station, (H4).....	127	Naseby, (C3).....	16	Raddison, (D3).....	349	Southey, (G5).....	287	Vidora, (B6).....	78
Leslock Station, (G4).....	312	Neidpath, (D5).....	232	Radville, (C6).....	813	South Fork, (C6).....	75	Viscount, (F4).....	272
Lewnan, (H5).....	92	Neilburg, (B3).....	200	Rama, (H4).....	201	Sovereign, (D4).....	127	Vonda, (F3).....	313
Liberty, (F4).....	178	Neptune, (C6).....		Ravenscrag, (C6).....	69	Spalding, (G3).....	203	Wadena, (H4).....	679
Lilac, (D3).....	12	Netherhill, (C4).....	133	Raymore, (G4).....	266	Speedwell, (C2).....		Wakaw, (F5).....	702
Limerick, (E6).....	296	Netherford, (J5).....	420	Readlyn, (F6).....	150	Speers, (D3).....	145	Waldeck, (D5).....	102
Lintlaw, (H3).....	168	Neville, (D6).....	165	Redburn, (D3).....	14	Spinney Hill, (C3).....	10	Waldheim, (E3).....	393
Lipton, (H5).....	319	New Osgoode, (H2).....	96	Red Cross, (B2).....		Spiritwood, (D2).....	218	Waldron, (J5).....	128
Lisleux, (C6).....	80	Nipawin, (H2).....	1,344	Red Deer Hill, (E3).....	17	Springside, (J4).....	181	Walpole, (K6).....	59
Livengol, (E2).....	88	Nobleville, (H3).....		Redfield, (D2).....	28	Spring Valley, (F6).....	118	Wapella, (K5).....	430
Lloydminster, (A2).....	1,052	Nokomis, (F4).....	421	Red Pheasant, (C3).....	11	Springwater, (C4).....	147	Warman, (E3).....	60
Lockwood, (G4).....	136	Nora, (H3).....	35	Redvers, (K6).....	195	Spruce Home, (F2).....	37	Wartime, (C4).....	73
Lone Rock, (A2).....	57	Norbury, (D2).....		REGINA, (G5).....	58,245	Spruce Lake, (B2).....	138	Wasceca, (B2).....	123
Loomis, (C6).....	59	Norge, (D6).....		Regina Beach, (F5).....	243	Spy Hill, (K5).....	133	Watrous, (G4).....	1,138
Loon Lake, (B1).....	202	Northay, (J4).....	306	Renown, (F4).....	70	Stalwart, (F4).....	75	Watson, (C3).....	516
Loreburn, (E4).....	153	North Battleford, (C3).....	4,745	Reserve, (J3).....	22	Star City, (G3).....	519	Wauchope, (K6).....	74
Lorlie, (H5).....	73	Northgate, (J3).....	37	Resource, (G3).....	170	Straynor Hall, (C6).....		Webb, (C5).....	222
Love, (G2).....	111	North Portal, (J6).....	145	Revenue, (B3).....	55	Steele, (H3).....		Weirdale, (F2).....	101
Loverna, (B3).....	156	Northside, (F2).....	13	Reward, (B3).....	468	Scenen, (J4).....	234	Weldon, (F2).....	204
Lucky Lake, (D4).....	268	Nut Mountain, (H3).....	218	Rhein, (J4).....	142	Stewart Valley, (D5).....	125	Welwyn, (K5).....	250
Lumsden, (G5).....	449	Oban Station, (D3).....	40	Riceton, (G5).....	137	Stockholm, (J5).....	233	West Bend, (H4).....	64
Luseland, (B3).....	370	Odessa, (H5).....	207	Richard, (D3).....	137	Stony Beach, (F5).....	80	Weyburn, (H6).....	6,179
Lydden, (C4).....	19	Ogema, (C6).....	330	Richardson Sta- tion, (G5).....	33	Stony Rapids, (M2).....		Wheatstone, (F6).....	21
McCord, (E6).....	129	Okema Beach, (F2).....	26	Richlea, (C4).....	135	Stornoway, (K4).....	138	White Bear, (C5).....	76
Macdowall, (E2).....	31	Okla, (H3).....		Richmond, (B5).....	98	Storthoaks, (K6).....	99	Whitebeech, (K3).....	
McGee, (C4).....	82	Old Wives, (E5).....		Ridgedale, (H2).....	221	Stoughton, (J6).....	302	White Fox, (H2).....	224
McKague, (G3).....	87	Oiga, (B6).....		Ridpath, (C4).....	44	Stove Creek, (J3).....		Whitesand, (J4).....	
McKinn, (J4).....		O'Malley, (E4).....	455	Ritchie, (C6).....	19	Stranraer, (C4).....	77	White Star, (F2).....	
Macklin, (A3).....		Onion Lake, (B2).....	54	Riverhurst, (E5).....	252	Strasbourg Station, (G4).....	442	Whitewood, (J5).....	689
McLaren, (B2).....	160	Onward, (B4).....	11	Robarts, (B6).....	93	Strongfield, (E4).....	942	Whitkow, (D3).....	90
McLean, (C5).....	122	Orcadia, (J4).....		Rocanville, (K5).....	443	Strong Pine, (F2).....		Wiggins, (C4).....	
McMahon, (D5).....	214	Orkney, (D6).....	99	Roche Perce, (J6).....	90	Struan, (D3).....	50	Wilcox, (G5).....	247
MacNutt, (K4).....	129	Ormonston, (F6).....	112	Rockglen, (F6).....	239	Sturgeon River, (E2).....	346	Wild Rose, (E2).....	
Macoun, (H6).....	101	Osage, (H6).....	67	Rock Haven, (B3).....	99	Sturgis, (J4).....	154	Wilkie, (C3).....	1,232
Macorie, (E4).....	64	Oster, (E3).....	134	Rodgers, (E5).....		Success, (D5).....		Willmar Station, (J6).....	53
McTaggart, (H6).....	95	Othron, (J4).....	41	Rokeby, (J4).....	53	Summerberry, (J5).....	144	Willowbrook, (J4).....	120
Madison, (B4).....	422	Outlook, (E4).....	505	Roseville, (D4).....	1,470	Sunkist, (D5).....		Willow Bunch, (F6).....	454
Major, (B4).....	135	Overland, (G6).....		Rose Valley, (H3).....	348	Sunset Lake, (G3).....		Willows, (F6).....	37
Mankota, (D6).....	167	Oxbow, (J6).....	465	Rosthern, (E3).....	1,149	Superb, (B4).....	43	Winmer, (G3).....	13
Manor, (K6).....	211	Paddockwood, (F2).....	139	Rouleau, (G5).....	441	Surbiton, (D4).....	18	Windthorst, (J5).....	160
Mantario, (B4).....	68	Palmer, (E6).....	47	Ruddell, (D3).....	62	Sutherland, (E3).....	888	Winter, (B3).....	58
Maple Creek, (B6).....	1,085	Pambrun, (D6).....	20	Runciman, (G3).....	16	Swanson, (D4).....	42	Wiseton, (D4).....	163
Marcelin, (E3).....	257	Pangman, (G6).....	150	Runnymede, (K4).....	71	Swift Current, (D5).....	5,594	Wishart, (G4).....	140
Marchwell, (K5).....	76	Paradise Hill, (B2).....	145	Rush Lake, (D5).....	125	Sylvania, (G3).....	70	Wolsley, (H5).....	838
Margo, (H4).....	173	Parkbeg, (E5).....	101	Ruthilda, (C4).....	107	Tadmorc, (J4).....		Wood Mountain Station, (E6).....	100
Markinch, (G5).....	128	Parkman, (K6).....	62	Rutland Station, (B3).....	26	Tako, (B3).....	51	Woodrow, (E6).....	184
Marquis, (F5).....	100	Parkside, (E2).....	159	St. Benedict, (F3).....	153	Tallman, (E3).....		Wordsworth, (J6).....	65
Marsden, (B3).....	114	Pascal, (D2).....		St. Boswells, (D5).....	106	Talmage, (H6).....	118	Wroxtton, (K4).....	140
Marshall, (B2).....	94	Pasqua, (F5).....	46	St. Brieux, (G3).....	150	Tantallon, (K5).....	90	Wymark, (D5).....	155
Maryfield, (K6).....	333	Paswegin, (H3).....	60	St. Denis, (F3).....		Tarnopol, (F3).....	66	Wynyard, (G4).....	1,080
Mattes, (E2).....	20	Pathlow, (G3).....	72	Saint Front, (G3).....	8	Tate, (G4).....	132	Yarbo, (K5).....	14
Mawer, (E5).....	77	Patrick, (H5).....		St. Gregor, (G3).....	97	Theodore, (J4).....	335	Yellow Creek, (F3).....	169
Mayfair, (D2).....	86	Patriot, (C6).....		St. Hubert Mission, (J5).....		Thunder Creek, (E5).....		Yellow Grass, (H6).....	423
Maymont, (D3).....	205	Paynton, (B2).....	183	St. Julien, (E3).....		Tichfield, (D4).....	41	Yonker, (B3).....	26
Maczenod, (E6).....	153	Peebles, (J5).....	30	St. Louis, (F3).....	115	Tiger Hills, (F3).....	20	Yorkton, (J4).....	5,577
Meacham, (F3).....	148	Peesane, (H3).....	88	St. Luke, (J5).....		Tisdale, (H3).....	1,237	Young, (F4).....	340
Meadow Lake, (C1).....	971	Pelly, (K4).....	311	St. Walburg, (B2).....	447	Togo, (K4).....	250	Zealandia, (D4).....	172
Meathead, (C2).....	188	Pennant Station, (C5).....	233	Saltcoats, (J4).....	457	Tompkins, (C5).....	409	Zelma, (E4).....	82
Melaval, (E6).....	81	Pense, (G5).....	272	Salvador, (B3).....	141	Torquay, (H6).....	200	Zeneta, (J5).....	13
Melfort, (G3).....	2,005	Penzance, (F4).....	73	Sanctuary, (D4).....		Totzke, (F3).....	36	Zenon Park, (H2).....	108
Melville, (J5).....	4,011	Perdue, (D3).....	295			Tramping Lake, (B3).....	211		
Menham, (B5).....	123								
Mennon, (E3).....	18								

**The People.** The first white men who entered the territory that is now Saskatchewan found three tribes of Indians roaming the forests and prairies. These tribes were the Chippewa, the Plains Cree, and the Assiniboine Indians. The Chippewa lived north of the Churchill River. The Plains Cree roamed the Park Lands. The Assiniboine lived in the broad valley of the Assiniboine River in the Prairie Region.

The first settlers of the region were English and French fur traders, and French-Indian half-breeds, called *métis*. They came west from what is now Manitoba in the 1850's to establish fur-trading posts along the Saskatchewan and Assiniboine rivers. After the fur traders came farmers, lumbermen, and miners from eastern Canada and the United States. In the 1890's free homesteads began to disappear in the United States. Then there was a rush of homesteaders to Saskatchewan, which still had free land to offer. In the 1900's many immigrants from Europe began to arrive in the region.

Today, more than seven out of every ten persons in Saskatchewan is a native Canadian. The largest groups are those of English, Irish, and Scottish descent. Other European stocks represented are the French, Germans, Hungarians, Czechoslovakians, Swedes, Norwegians, Ukrainians, and Icelanders. About ten thousand Indians remain in the province as wards of the Dominion government.

**Agriculture.** The average farm in Saskatchewan covers 320 acres. Wheat is the principal crop on these huge farms. The average yearly wheat yield during a ten-year period was over 155,000,000 bushels. During the 1920's there was a trend toward mixed farming which has continued. The province now produces oats, barley, rye, flax, alfalfa, and potatoes and other root crops as well as wheat.

Cattle and dairy products are next in importance to wheat. Beef cattle are raised on the central Park Lands, where grazing conditions are excellent. Fine dairy herds are maintained around the larger cities. These regions also produce large quantities of poultry and eggs. The breeding of high-quality horses also is an important industry in the Park Lands.

**Minerals.** Most of the mines of Saskatchewan are located around the lakes of the northern forest region. The largest deposits of copper, nickel, and zinc are near Lakes Athabaska, Reindeer, Axis, and Rottenstone. Iron mines are located at Lakes Wapawekka, Reindeer, and Athabaska. Gold is mined around Lac la Ronge, Lake Amisk, and Lake Athabaska. Placer mining occurs along the North Saskatchewan and Waterhen rivers. Limestone quarries are located near Lake Amisk, Lake Cumberland, and Lac la Ronge. The Pipestone Lake area has talc mines. The Wapawekka Lake region has glass-sand quarries. Jumping-into-the-Water Lake has manganite (manganese ore) mines along its shores.

About a million and a half tons of soft coal are mined in southern Saskatchewan every year. The principal mines are located around the town of Estevan. Pottery-clay fields are worked in the southern areas. Petroleum and natural-gas wells are located in the southwestern part of the province near the Alberta border.

**Furs.** The forests of the north provide natural refuge

for a number of fur-bearing animals. Trappers roam the region to catch bear, otter, beaver, marten, wolf, and mink. Furs are also taken from animals raised on more than eight hundred fur farms in the central part of the province. The skins of fox, mink, raccoon, skunk, marten, and fisher come from these fur farms. More than two million pelts are sold in the province each year.

**Manufactures.** The most important industries of Saskatchewan are those which process farm crops. Mills which grind flour, feed, and cereals from the grain crops are located at Regina, Saskatoon, and Moose Jaw. Plants which make butter and cheese are located at Prince Albert and Regina. Meat-packing establishments are located in all the larger cities. Regina is the chief city for petroleum refineries and printing and publishing plants. Moose Jaw is the most heavily industrialized city.

**Fisheries.** Commercial fishing is carried on chiefly in the Saskatchewan River and the larger northern lakes. Whitefish and trout make up the largest catches. Large numbers of pike, pickerel, tullibee, and bass also are taken from the inland waters of the province.

**Transportation.** The fur traders and early settlers used the rivers for transportation. These water routes are still in use. Large flatboats carry cargo along the Saskatchewan River for many miles. But river transportation did not meet all the needs of the growing communities. Railways and highways were built during the 1850's.

**Railways.** There are 8,780 miles of railway track in the province. These are lines of the Canadian Pacific Railway and the Canadian National Railways. Connections are made with the Hudson Bay Railway of Manitoba, which leads to the Hudson Bay port of Churchill.

**Highways.** The provincial highway system has more than eight thousand miles of road. An important part of the highway system is a series of ferries which makes it possible for motor traffic to cross the North Saskatchewan River and the South Saskatchewan River. The Trans-Canada Highway, a national motor road, runs east and west through the most thickly populated region of the province.

**Airways.** Provincial and national air lines have routes reaching to all parts of the province. There are airports at Regina, Saskatoon, Moose Jaw, North Battleford, Weyburn, Yorkton, Dafoe, Mossbank, and Prince Albert.

**Commerce.** During World War I the export trade of the province became more than three times as large as it had been, because of the demand for the grain, meat, and minerals of Saskatchewan. This trade increased even more during World War II. Large quantities of agricultural and mineral products are shipped by rail to eastern ports of Canada and to the United States. The province imports large quantities of machinery, textiles, clothing, and such luxury items as tobacco and the products of distilleries.

**Press and Radio.** The leading daily newspapers of the province include the *Regina Leader-Post*, the *Saskatoon Star-Phoenix*, the *Moose Jaw Times-Herald*, and the *Prince Albert Herald*. There are about 150 weekly papers published in rural areas.

The principal radio broadcasting stations include

those at Regina, Yorkton, Prince Albert, Watrous, Moose Jaw, and Saskatoon.

### Social and Cultural Achievements

**Colleges and Universities:** University of Saskatchewan and Saskatoon, established in 1907 (affiliated colleges, Saint Andrew's, Emmanuel, and Lutheran Seminary), Campion, Sacred Heart, Saint Peter's, and Luther, and Junior Colleges.

**Provincial Welfare, Correctional, and Penal Institutions:** *Children*, Industrial School for Boys at Regina, Children's Aid Societies at Saskatoon, Regina, Moose Jaw, Prince Albert, and Yorkton. *Physically handicapped*, School for the Deaf at Saskatoon, Home for the Infirm at Wolseley, sanatoria at Saskatoon, Prince Albert, and Fort Qu'Appelle. *Mentally handicapped*, hospitals at North Battleford and Weyburn. *Prisons*, Provincial jails at Regina, Prince Albert and Moosomin (men), and North Battleford (women).

**Education.** The early settlers of Saskatchewan realized the need for schools, and took action to provide education for their children. For a time after Saskatchewan was organized as a province in 1905, school districts were created at the rate of one a day.

Each school district is administered by a local board of trustees. Most of the schools are partly supported by the provincial government, which maintains a superintendent for each district. Saskatchewan has a separate school system, with independent divisions for Roman Catholic and Protestant students. At present the school districts are being grouped into large school units. The province has more than five thousand high schools, which are called collegiates here. For a description of the chief institution of higher learning in Saskatchewan, see SASKATCHEWAN, UNIVERSITY OF.

**Libraries.** Only the largest cities of Saskatchewan have municipal libraries. For the people in rural areas the province operates the Open Shelf Library at Regina, which mails books to readers free of charge. The readers select the books from a catalogue. Traveling libraries also circulate books in the rural areas. The Legislative Library at Regina has a large collection of reference material.

**Arts and Crafts.** Home handicrafts were a necessary part of the life of the early prairie settlers, who lived too far from the cities to buy much manufactured goods. The present-day population has kept these handicraft skills as a reminder of the pioneer past. Beautiful mats, rugs, quilts, cushions, and textiles are made by Saskatchewan women and are often displayed at rural fairs.

Music and drama festivals are held frequently in various parts of the province. There are several amateur dramatic groups, of which the most outstanding is probably the Saskatchewan Little Theater movement.

There is an excellent collection of paintings, books, and scientific and historical items in the Provincial Museum at Regina.

The early history of the province and of the west has been brilliantly written by A. S. Morton and E. J. Oliver, both of Saskatoon. C. C. Lingard of Regina has dealt with more recent political events. A group of distinguished artists includes Margaret Frame, James Henderson, Gus Kenderdine, Ingals Sheldon Williams, and Emile Walters.

**Religion.** The principal religious faiths in Saskatch-

ewan are the Roman Catholic and the United Church of Canada. Other leading denominations are the Anglican, Lutheran, Presbyterian, Greek Orthodox, and Mennonite.

**Social Welfare.** The province supplies free treatment for tuberculosis and cancer patients, and an insurance system for hospital care. Children's Aid Societies became operative on January 1, 1947. Old-age pensions, mothers' allowances, and many other forms of social aid have been well established in Saskatchewan.

### Recreation and Outdoors

The many vacation attractions of Saskatchewan have earned the province its popular name, THE PLAYGROUND OF THE WEST. Fishermen come from afar to fish the northern rivers for the trout that sometimes weigh as much as fifty pounds. Hunters find a wealth of big game in the forests, and many varieties of game birds in the Park Lands and on the prairies. Thousands of tourists come to Saskatchewan each season to vacation at the summer resorts in the southern part of the province. In winter, other visitors are attracted by the snow sports on the hills of northern Saskatchewan.

**Provincial and National Parks and Forests** have been established in the most scenic regions of the province. Prince Albert National Park, thirty-six miles north of Prince Albert, contains hundreds of lakes and streams. Its area is 1,869 square miles.

**Provincial Parks** which have recreation camps and grounds include:

**Cypress Hills** (18.28 square miles), south of Maple Creek, in the heart of a stately forest of pine and spruce. From the top of Bald Butte the visitor gets a view of the countryside for many miles around.

**Duck Mountain** (81 square miles), containing Madge Lake, one of the beauty spots of the province and one of the best-stocked fishing lakes.

**Good Spirit Lake** (6 square miles), with wide sand beaches along the west shore of Good Spirit Lake, near Yorkton.

**Green Water Lake** (35 square miles), within a virgin northern forest between Green Water and Moreen lakes.

**Katepwe** (.026 square miles), 65 miles northeast of Regina, a scenic valley containing the four long, narrow Qu'Appelle Lakes.

**Little Manitou** (4 square miles), near Watrous. A château built of field stones overlooks Watrous Beach on Little Manitou Lake. The lake waters are believed to have medicinal value for certain ailments.

**Moose Mountain** (192 square miles), 50 miles from Northgate. The park contains many lakes well stocked with game fish, and dense forests where caribou, elk, moose, and deer roam.

**Other Interesting Places to Visit** attract thousands of tourists to Saskatchewan each year. Such places include the following:

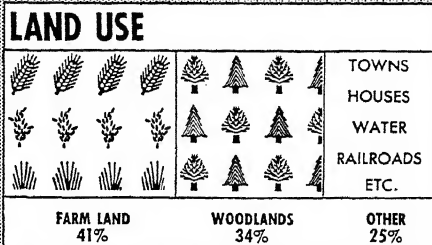
**Batoche Battlefield**, 6 miles north of Duck Lake, the headquarters of the métis during the Saskatchewan Rebellion.

**Cumberland House**, on the Saskatchewan River, an early trading post of the Hudson's Bay Company.

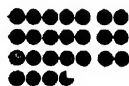
**Fort Qu'Appelle**, site of the signing of a treaty by which the Indians surrendered the land to Queen Victoria in 1874.

**Fort Walsh**, in the Cypress Hills, first headquarters of the North West Mounted Police. Here Sitting Bull, the Sioux Indian Chief, found protection from United States soldiers in 1876.

# SASKATCHEWAN



EACH DISK REPRESENTS 5 MILLION DOLLARS  
DISKS REPRESENTING FACTORY PRODUCTS  
INDICATE VALUE ADDED TO MATERIALS IN THE FACTORY



## FARM ANIMALS



## OATS



DAIRY



POULTRY PRODUCE



BARLEY



## FRUITS AND VEGETABLES



## POTATOES



RYE



## HAY AND CLOVER



**FLAXSEED**



PELTS (TRAPPING  
AND FUR FARMING)



**FACTORY**  
(PLANTS AND MILLS)

FLOUR, ETC.

PRINTING AND  
PUBLISHING

## BUTTER AND CHEESE



## PETROLEUM PRODUCTS



## WOOD PRODUCTS



## SLAUGHTERING AND MEAT PACKING



THE SYMBOLS ON THE MAP INDICATE LEADING AREAS ONLY

Based on latest Government statistics;  
prepared for the exclusive use of the  
**WORLD BOOK ENCYCLOPEDIA** by Pictograph Corporation



COPPER, ZINC

**GOLD**

COAL



**Highway No. 2**, a 350-mile motor road running north from the International Border through the heart of the wheat country and the Park Lands to Prince Albert National Park.

### Government

**National:** Senators, 6. Members of Parliament, 17.

**Provincial:** Members of Legislative Assembly, 55. *Capital*, Regina.

**Executive** power is held by the Premier, who is the leader of the majority party in the Legislative Assembly. The British Crown is represented in the province by a Lieutenant-Governor. A cabinet is chosen by the Premier from among members of the Legislative Assembly. The cabinet members head the various departments of the government.

**Legislative** functions are carried out by the Legislative Assembly. Fifty-two members are elected from districts and three represent active service personnel. The term is five years. The lawmaking powers of the assembly are limited by the British North America Act.

**Judicial** decisions are made by five court divisions. These courts, in the order of their importance, are the Court of Appeal, the Court of King's Bench, the District Courts, the Magistrates Courts, and Juvenile Delinquency Courts. Superior court judges are appointed for life by the Dominion Government.

**Local Government** is carried on by districts of the province. These districts are called rural and urban municipalities. The municipality is governed by a council. The head of a rural council is called the reeve. Urban municipalities are either cities, towns, or villages.

**Politics.** During the early history of the province, the traditional Liberal and Conservative parties shared power in Saskatchewan. In 1944, however, the Co-operative Commonwealth Federation, a Socialist party, won the general election and formed a government.

### Province Symbols and Events

**Coat of Arms.** Three golden sheaves of wheat on a green background symbolize Saskatchewan's position as the leading wheat-producing province of Canada. The red lion on a band at the top of the shield shows the loyalty of the province to the British Crown.

**Flower.** Prairie Lily. See FLOWER (color plate, Prairie Flowers).

**Annual Events** which draw visitors from many sections include:

*Saskatchewan Field Trials*, near Moose Jaw. Competition among hunting dogs of various breeds. Summer (no fixed date).

*Bonspiels*, Regina, Saskatoon, and other centers. Tournaments of curling, a sort of bowling on ice. (See CURLING.) Winter (no fixed dates).

*Western Rodeo*, Regina. Riding and roping competition among cowboys from the open range cattle country. Summer (no fixed dates).

### History

1670 Rupert's Land created.

1867 Rupert's Land made a part of the Northwest Territories.

1870 Métis moved west of the Red River Colony.

1885 Saskatchewan Rebellion.

1905 Province of Saskatchewan organized.

1917 Saskatchewan farms helped feed the Allies.

1939 Farms and factories turned to war production.

1945 Saskatchewan agriculture and industry converted to peacetime production.

**Early Days.** At first Saskatchewan was a part of the Hudson's Bay Company fur trading empire known as Rupert's Land. The region included the present-day provinces of Manitoba, Saskatchewan, and Alberta. See HUDSON'S BAY COMPANY; RUPERT'S LAND.



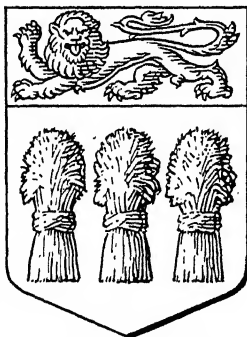
The Province of Saskatchewan was organized in 1905. The black area shows the province before that time. Broken lines through the black show the part of the old province that was included in the new. Shaded parts north and south of the black were formerly parts of the districts of Athabaska and Assiniboia. These districts are now in the remapped province.

The story of the exploration of what is now Saskatchewan is the same as that of Manitoba, since most of the explorers went as far west into Rupert's Land as the rivers would take them. See MANITOBA (History).

In 1867 Rupert's Land was made a part of the North West Territories (now Northwest Territories). The territories contained the districts of Athabaska, Assiniboia, and Saskatchewan. The first settlements in the region that is now Saskatchewan were made by French Canadian half-breeds, called *métis*. The *métis* moved to the west in 1870 after they had been defeated in a rebellion against the Red River Colony. See RED RIVER REBELLION.

The *métis* were not satisfied with their new homes, however, and in 1885 Louis Riel led them in another unsuccessful uprising called the Saskatchewan Rebellion.

The rebellion called the attention of the Canadian government to the need for stronger local government in the west. In 1905 the provinces of Saskatchewan and Alberta were organized.



# SASKATCHEWAN MEMORABLE EVENTS



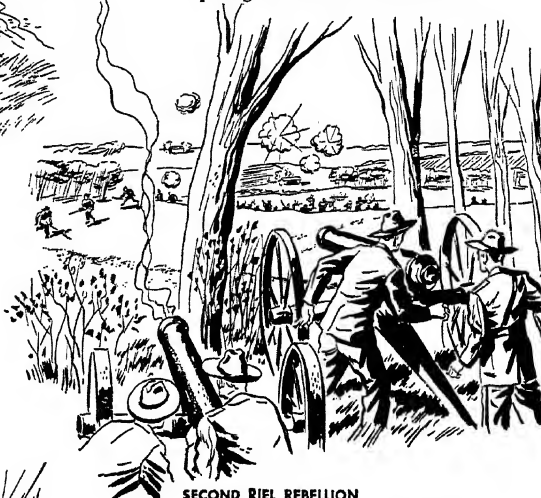
## DISCOVERY OF SASKATCHEWAN RIVER

The Chevalier de la Verendrye failed to find a Northwest Passage, but discovered the river and started fur trading.



## PROVINCIAL STATUS GRANTED

In 1905 Saskatchewan became a province of the Dominion, upon passage of a bill in Parliament.



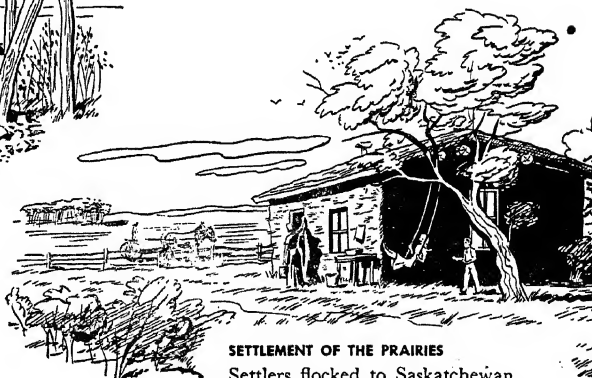
## SECOND RIEL REBELLION

The second rebellion against the white men, led by Louis Riel, was shattered at Batoche in 1869.



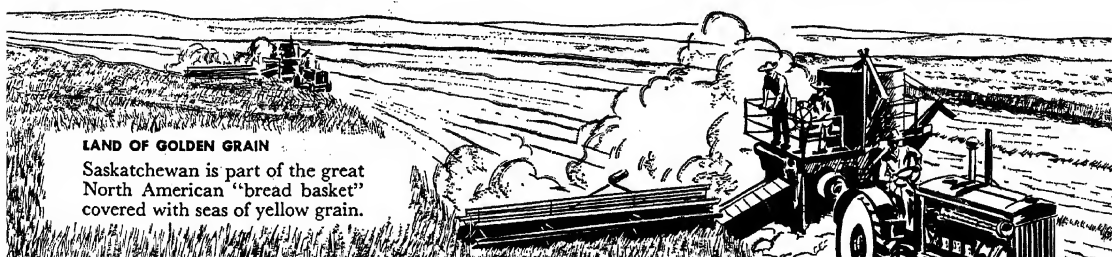
## MOUNTED LAW AND ORDER

Royal Canadian Mounted Police maintained orderly settlement of Saskatchewan during the years after 1883.



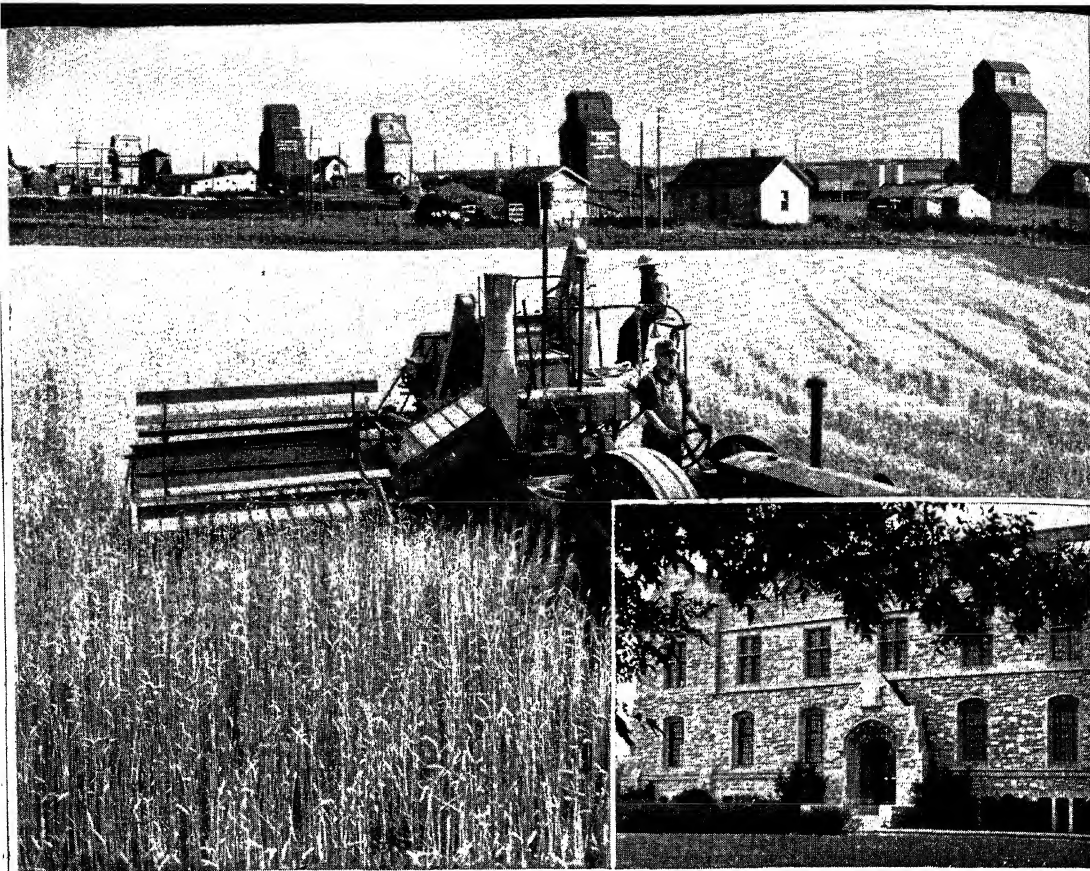
## SETTLEMENT OF THE PRAIRIES

Settlers flocked to Saskatchewan after 1900 when free homesteads attracted farmers to the new lands.



## LAND OF GOLDEN GRAIN

Saskatchewan is part of the great North American "bread basket" covered with seas of yellow grain.



#### FARMING IN SASKATCHEWAN

*Above:* Reaping the harvest in Saskatchewan, leading wheat-producing province of Canada. Silhouetted on the skyline are grain elevators where the grain is stored until it can be transported to milling centers. *Above right:* The

Field Husbandry building of the College of Agriculture, at the University of Saskatchewan in Saskatoon. *Below:* Shearing sheep on a ranch near Regina. The fleeces are packed tightly in bales and sent to market by truck or rail.

Photos: James Sawdery; Saskatchewan Bureau of Publications; Canadian Government Motion Picture Bureau



**Progress as a Province.** Saskatchewan has led the provinces in establishing co-operative markets and loan agencies to aid farmers. The province also has been exceptionally progressive in the improvement of educational standards.

During World War I, Saskatchewan made important contributions to the Allied cause in the form of food supplies and men for the Canadian army. During World War II, Saskatchewan helped in these ways again, and also organized its rapidly growing industrial production to the needs of the war effort. With the coming of peace, the provincial government planned further development of the many natural resources of Saskatchewan. F.C.G.

**Related Subjects.** The reader is also referred to:

#### CHIEF PRODUCTS

Barley	Fur Industry	Rye
Cattle	Lumber	Wheat
Flax	Oats	

#### CITIES AND TOWNS

Battleford	Regina
Moose Jaw	Saskatoon

#### HISTORY

Assiniboia	North West Company
Canada, Government of	Province
Canada, History of	Rupert's Land
Hudson's Bay Company	Saskatchewan Rebellion

#### PHYSICAL FEATURES

Assiniboine River	Churchill River
Athabaska, Lake	Saskatchewan River

#### UNCLASSIFIED

Flag (color plate, Flags of British Commonwealth of Nations)	Saskatchewan, University of
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**Books to Read** are listed at the end of the article CANADA.

**An Outline** suitable for Saskatchewan will be found with the article "Province."

#### Questions

Why is Saskatchewan called "Canada's Bread Basket"? "The Playground of the West"?

What product of Saskatchewan is the world's most precious mineral? From what raw ore is this mineral extracted? What other valuable mineral is obtained from the same ore?

What is a chinook? What effect does it have on the climate of Saskatchewan?

What qualities of the soil and climate make the prairie lands of Saskatchewan especially suitable for farming?

What are the principal products of these natural regions of Saskatchewan: the Prairie Region; the Park Lands; the Forest Region?

What has the province government done to develop water power in Saskatchewan?

**SASKATCHEWAN, UNIVERSITY OF**, is a coeducational school at Saskatoon, Saskatchewan, Canada. It has colleges of arts and science, agriculture, and law, and schools of engineering, pharmacy, accounting, medical sciences, education, and household science. Saskatchewan University is connected with two theological colleges, Emmanuel and St. Andrew's. Saskatchewan was founded in 1907 and has an average enrollment of about 1,500.

**SASKATCHEWAN REBELLION, or SECOND RIEL REBELLION**, was an uprising of the half-breeds in Canada in 1885. Louis Riel led the revolt. In 1870 the half-breeds had taken part in the Red River Rebellion in Manitoba. (See RED RIVER REBELLION.) After the Red River Rebellion, the Canadian government gave 240 acres of Manitoban land to each of the dissatisfied half-breeds, or *métis*. At first this generous move seemed to have satisfied the *métis*.

But Manitoba soon began to fill with settlers from eastern Canada. Many of the restless *métis* gave up their land grants and drifted westward to the Saskatchewan River Valley. There they were again disturbed by the advance of the settlements. The construction of the Canadian Pacific Railway further angered them. There were various causes for the revolt. The Indians and half-breeds were afraid that the settlers would destroy the buffalo herds upon which they depended for food and clothing. They had no legal titles to the lands where they lived, and feared that they would lose their homes. They also disliked the Canadian government's method of surveying and laying out farms. They preferred the old French system by which all farms were narrow strips fronting on the river.

Louis Riel had been living in Montana since the failure of the Red River Rebellion. In 1884 the *métis* asked him to come to Saskatchewan to help them uphold their rights and Riel agreed. In March, 1885, the *métis* elected him president of a provisional government they set up at Saint Laurent. Riel was moderate at first, and there seemed to be a possibility of compromise between the Canadian government and the *métis*.

This possibility vanished when a skirmish between the *métis* and the Mounted Police took place at Duck Lake. An uprising of the Cree Indians followed the trouble at Duck Lake. Led by Chief Big Bear, the Cree attacked a settlement at Frog Lake, where they killed the men and carried off the women and children.

The news of this outbreak aroused the people of eastern Canada. A force of 4,400 men was raised and sent into the Saskatchewan territory. The *métis* were no match for the troops and were quickly defeated. Riel himself was captured in the fall of Batoche, and was hanged for treason.

The Saskatchewan Rebellion had important results. The Dominion Government recognized the claims of the *métis*, and gave them legal titles to their lands. The rebellion showed the increasing importance of the North-West (now Northwest) Territories, and they were given representation in Parliament. But the most important effect was that it stimulated national feeling, and brought home to all Canada the idea of Canadian unity. See also RIEL, LOUIS. E.R.A.

**SASKATCHEWAN RIVER.** This Canadian stream, together with the Nelson River, forms the greatest river system flowing into Hudson Bay. The Saskatchewan River system is 1,205 miles long from its mouth in Lake Winnipeg to the source of the Bow River, its main branch. The system drains an area of 158,000 square miles, an area half again as large as that of the Great Lakes. Most of the Saskatchewan is narrow and rapid.

The Saskatchewan River proper is formed by the North and South Saskatchewan, which join near the city of Prince Albert. From here it flows eastward 240 miles to the northwest corner of Lake Winnipeg.

The North Saskatchewan starts in the glaciers on Mount Hooker in the Rocky Mountains of Alberta. It flows eastward 760 miles to meet the south branch.

The South Saskatchewan is usually considered as the main stream and is 865 miles long. Some of its several branches rise in northern Montana. The south branch is most useful for irrigation. It is not so important as the north branch for boat transportation. L.D., JR.

**SASKATOON**, *SAS kah TOON*, Saskatchewan (population 43,027), is the distributing city for a large and fertile farming region of northern Saskatchewan. Saskatoon lies on the South Saskatchewan River. It is the only large city between Winnipeg, to the southeast, and Edmonton, to the northwest.

A grain elevator in the city can store 5,500,000 bushels of grain. Saskatoon has a stockyards and several cold-storage plants. Saskatoon is the home of the University of Saskatchewan, the provincial Norman School and Agricultural Farm, and the Dominion Forestry Station.

Saskatoon was founded in 1882 by John N. Lake for the Temperance Colonization Society of Toronto. Saskatoon became a village in 1901. It received a town charter in 1903 and a city charter in 1906. F.C.C.

**SASSAFRAS**, *SAS ah fras*, is a tree of the laurel family. It has a fragrant bark that yields an oil used in flavoring medicine and making "sassafras tea." The tree grows from thirty to fifty feet high, and sometimes higher. It may grow along roadsides as a mere shrub. The sassafras is found from southern Vermont to Florida and west as far as Texas and Kansas. In autumn the tree is strikingly beautiful with its rich gold and scarlet leaves. The leaves are of three different shapes. Some are rather oval with no lobes, or divisions, some have two lobes, and others have three. All three kinds are often found on one twig. The flowers are yellow and



Rutherford Platt

Leaves of the Sassafras Tree differ in shape, even on the same twig. Some have no lobes, others have two or three.

the ripened fruit is a dark blue berry of the *drupe* type.

In some parts of the country, drugstores and fruit stores sell the bark and roots to persons who want to make sassafras tea, which is often used for a spring tonic. A sticky substance which comes from the leaves and twigs is used in the southern states to flavor gumbo soups. Sassafras wood is soft and light. It is seldom used except for posts and rails. W.M.HAR.

**Classification.** The sassafras tree belongs to the family *Lauraceae*. Its botanical name is *Sassafras albidum*.

**SASSAFRAS MOUNTAIN.** See SOUTH CAROLINA (Physical Features).

**SASSANID**, *SAS ah nid*, or **SASSANIDAE DYNASTY.** See IRAN (History).

**SASSARI**, *SAHS sah ree*. See SARDINIA.

**SASSOON**, *sa SOON*, **SIEGFRIED** (1886- ), is an English novelist and poet. His *Memoirs of a Fox-Hunting Man*, published in 1928, won the Hawthornden and James Tait Black prizes. This novel was followed by *Memoirs of an Infantry Officer*, which was based on Sassoon's experiences in World War I, and by *Sherston's Progress*. Later the three volumes were published together under the title *Memoirs of George Sherston*. Sassoon was born in London and was educated at Clare College, Cambridge University. G.S.B.

**His Works** include *The Old Century and Seven More Years*; *The Weald of Youth*; and the volumes of poetry *The Old Huntsman*, *Counter Attack*, *Satirical Poems*, *Heart's Journey*, *Vigils*, and *Rhymed Ruminations*.

**SATAN**, *SA tan*. See DEVIL.

**SATEEN**, *sa TEEN*, is a cotton material made with mercerized yarns. The weave is the same as in satin except that the lustrous surface is across the goods and not lengthwise as in satin. Plain-color or printed sateen is used for linings, pajamas, draperies, and comforters. See also SATIN. G.G.DE.

**SATELLITE**, *SAT eh lite*, is a word which comes from the Latin *satelles*, meaning an attendant. In astronomy the term is used to describe a heavenly body which revolves around a planet. Our moon, which follows the earth in its journey round the sun, is a satellite. The name is also used to describe those fainter or dark bodies which revolve about certain stars and cause their light to grow dimmer at various intervals. This phenomenon produces the eclipsing, or variable, stars.

The following table gives the number of satellites attending the planets of our system:

Saturn . . . . . 9	Mars . . . . . 2
Jupiter . . . . . 11	Neptune . . . . . 1
Uranus . . . . . 4	Earth . . . . . 1 E.C.S.

See also PLANET.

**SATIN**, *SAT in*, is the name of a special kind of weave in which the crosswise yarns, or *weft*, do not cross the lengthwise, or *warp*, yarns as often as in a plain weave. The name *satin* is also used to mean silk, nylon, and rayon or cotton fabrics which have a satin weave. Satin fabrics usually have a diagonally ribbed, or *twill*, back. But sometimes satin is woven with a crepe back, or of double satin, as in ribbon. G.G.DE.

**SATIRE**, *SAT ire*, is a literary composition which ridicules persons or the things that they do. The term originated with the Romans, who applied it only to poetry. Some poets wanted to improve the conditions which



they satirized. Others wrote cruelly out of mere malice or personal bitterness. Martial was one of the most famous of Latin satirists.

Elijah's taunts of the prophets of Baal on Mount Carmel are examples of scathing satire. Aristophanes and Lucian were masters of satire in Greece. Besides Martial, other Roman poets who employed satire as a weapon included Horace, Catullus, Juvenal, Persius, and Ovid.

One of the world's greatest satirists was Erasmus of Rotterdam, author of *The Praise of Folly*. William Langland's *Piers Plowman* was the first notable English satire. Langland railed against the clergy and the law courts. John Dryden's *Absalom and Achitophel* and *MacFlecknoe*, and Alexander Pope's *Dunciad* are among the greatest satirical poems in English. Jonathan Swift's *Gulliver's Travels*, written in prose, is one of the greatest satires in any language. To these names must be added those of Laurence Sterne, Tobias Smollett, Samuel Butler, Joseph Addison, William Cowper, Lord Byron, and Robert Burns. Among the French masters of this art were Rabelais, Molière, Voltaire and Anatole France. Germany is represented by Richter and Heine; Spain by Cervantes; Norway by Ibsen; Sweden by Strindberg; and Russia by Gogol. Thomas C. Haliburton, who used the pen name of Sam Slick, was the foremost Canadian satirist. In the United States, James Russell Lowell, Mark Twain, "Artemus Ward," and Finley Peter Dunne were effective satirists of previous generations. In our times satire is a common weapon used in cartoons, verse, drama, the motion pictures, and short prose sketches. B.R.

**Related Subjects.** The reader is referred to lists of Essayists, Critics, and Satirists in the BIOGRAPHY section of the READING AND STUDY GUIDE and to the following articles:

Aristophanes	Molière
Gulliver's Travels	Pope, Alexander
Humor (The Types of Humor)	Rabelais, François
Juvenal	Swift, Jonathan

**SATIRIST.** See list of Essayists, Critics, and Satirists in the BIOGRAPHY section of the READING AND STUDY GUIDE.

**SATRAP, *SA trap*.** See CYRUS THE YOUNGER; DARIUS.

**SATURATION, *SAT yoo RA shun*.** See EVAPORATION; HYGROMETER.

**SATURDAY**, called *Sæter-daeg* by the Anglo-Saxons, is the seventh day of the week. It is named for the Roman god Saturn. It is the only day named for a Roman god. Saturday is the Sabbath among the orthodox Jews and Seventh-Day Adventists. In some places Saturday afternoon is a legal holiday. More and more employers everywhere are giving their workers a half or full holiday on Saturday. See also WEEK. G.HUM.

**SATURN** was the youngest son of Uranus (Heaven) and Gaea (Earth) in Roman mythology. He was a god of the harvest and ruled the world in its Golden Age, which was an age of peace and justice. The Greeks called him Cronus, and it is under that name that most stories are told of him. He was a Titan, which was one step higher than a god.

Cronus married his sister Rhea and became the father of many gods, among them Demeter, Hera, Poseidon, Pluto, and Zeus. He swallowed his first five children because an oracle said that they would overthrow him. Rhea saved the sixth, which was Zeus. She wrapped a

stone in child's clothing and Cronus did not notice the difference. Zeus grew up and forced Cronus to cast up the other children. Then Zeus made Cronus go to Italy. The Italian people called him *Saturn*. This name comes from *sero* which means *I sow*.

Saturn taught the Italians the art of farming and made them prosperous. The festival called the Saturnalia was held in Rome each year beginning on December 17.

The Greek word *chronos* means *time*. Cronus is usually shown as a bent old man with a scythe in one hand. In the other hand he holds a serpent which bites its own tail. The story of his swallowing his own children means that time creates and then destroys. But the name Cronus did not really have much connection with the Greek word *chronos*. P.COL.

See also SATURNALIA; TITAN.

**SATURN** is a planet which is sixth in distance from the sun. It is the second largest planet in the solar system. The only planet that is larger than Saturn is Jupiter. Saturn is probably the most interesting planet in the sky. It looks like a big yellow star, and is quite bright. It is much larger than the earth, and its area is eighty times as great as the area of the earth. The ball of Saturn is about 73,000 miles in diameter and the greatest diameter of the rings is 170,000 miles. But Saturn is made up of very light material and is only one eighth as dense as the earth. In fact, Saturn is made of such light material that if it were possible to place the planet on water, it would float.

There is no life on Saturn. This is because the temperature is always at about 250 degrees below zero (Fahrenheit). Plant or animal life could not possibly exist at this temperature. Also, the atmosphere around Saturn does not contain oxygen necessary for life.

Saturn is very far from the sun and the earth. For a long time the ancient Greeks and Romans thought that Saturn was the farthest planet from the sun. Since then, astronomers have discovered other planets that are even farther away. Saturn is about 886 million miles from the sun and about 750 million miles from the earth. Saturn is so far from the sun that it takes  $29\frac{1}{2}$  years to make one revolution around the sun. This means that for every year on Saturn  $29\frac{1}{2}$  years have gone by on the earth. Saturn has shorter days than the earth. Each day is about  $10\frac{1}{4}$  hours long.

The most unusual thing about Saturn is the large ring around it that looks like a halo. This ring can be seen through a telescope. It looks like it is made of gauze. Saturn is the only planet that has such a ring. This ring was first seen by the scientist Galileo in 1610. Galileo noticed a peculiar shape to this planet which he was unable to explain. Almost fifty years later, in 1656, a Dutch astronomer called Huyghens explained that this halo was a large flat ring. But now it is known that this ring is actually made up of three separate rings. Each ring is made up of tiny particles that were once pieces of moons. These particles move about the planet at a very great speed. As they move about in their circle or ring they look like particles of dust moving in a ray of sunlight.

Saturn is the center of its own planetary system. It has nine smaller planets, or satellites, surrounding it.

## SAUDI ARABIA

**The First Five Photographs of Saturn** show a year in the planet's life—a year equal in length to  $29\frac{1}{2}$  earth years. At the top is the planet in 1912. Next, in 1921, the great thin rings around it presented only the outer edge to the observer on earth and were practically invisible. The third photograph shows the great white spot that appeared on Saturn (just under the ring) in 1933. In 1937 the rings were again almost flat. The fifth illustration shows the planet as it completed its solar year, in 1941. At the bottom of the page is the spectacular heavenly body as it appeared in 1943.

E. C. Slipher, Lowell Observatory

The largest satellite is Titan, which can be seen with a small telescope. It is about 760,000 miles from Saturn and is twice as heavy as our moon. Another satellite of Saturn is Iapetus, which is 2,200,000 miles from the planet and makes one revolution around Saturn in about 79 days.

E.C.S.

See also PLANET; SOLAR SYSTEM.

**SATURNALIA**, *SAT* er *NA* lih ah, was the name of an ancient Roman festival. The feast was given in honor of Saturn, the Roman harvest god. The festival began on December 17 and lasted for seven days. On the first day, public religious ceremonies took place, and sacrifices were offered to Saturn. On the second day, many families offered their own sacrifices of a young pig.

The Saturnalia festival was a gay occasion. Schools observed holidays and all public business was halted. Courts of law closed their doors, and no criminals could be punished. Families held gatherings and elaborate banquets. Even Roman slaves were free to attend the festival.

The last days of the festival were given over to visiting and exchanging presents. Some of the gifts were little clay images. They were called *sigillaria*, from the Latin word *sigilla*, which means *small images*. The last days of the festival were also called the *sigillaria*.

W.S.F.

See also SATURN.

**SATYR**, *SAT* er, or *SA* ter, was the name of gods of the woods in Greek mythology. There were many of them. They had the heads and bodies of men but from the waist down they were goats. At first they were supposed to be very ugly and animallike. They terrified the nymphs. Later they appeared as graceful young men with pointed ears, goats' hoofs, and small tails. Old satyrs were very fat and clumsy.

Satyrs were the friends and worshipers of Bacchus, and their leader was Pan. In Roman mythology they are called fauns.

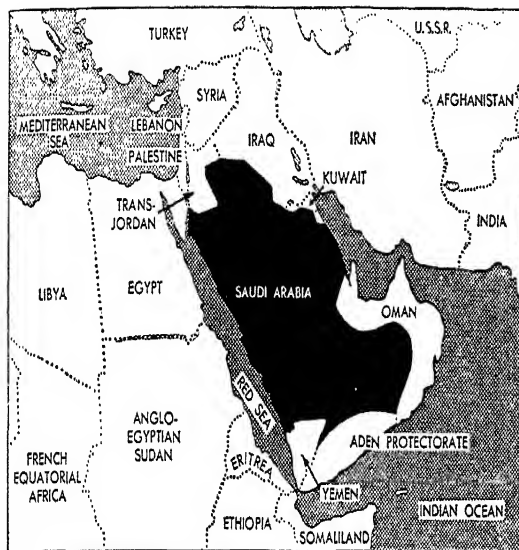
S.M.S.

See also FAUN; PAN; SILENUS.

**SAUDI**, sah OO dee, **ARABIA**, is an independent kingdom within the borders of Arabia. The kingdom is about as large as the state of California. It stretches from Trans-Jordan to Yemen. Saudi Arabia has been a single kingdom since 1926, when the territories of Hejaz and Nejd were combined. King Ibn-Saud was the leading organizer of the scattered Arabian tribes. Saudi Arabia has taken on great importance in international affairs because of its tremendous oil reserves.

**The Land and Its Resources.** Most of Saudi Arabia is desert. The country covers an estimated area of 150,000 square miles, and has an estimated population of 3,000,000.

The products of Saudi Arabia include honey, dates and many other kinds of warm-climate fruits, animal



Location Map of Saudi Arabia

hides, wool, charcoal, and butter. But it is the oil inside the earth which makes Saudi Arabia important. The rich petroleum fields are scattered throughout the country. They are operated by oil companies from Great Britain, the United States, and Egypt.

**The People.** Most of the people of Saudi Arabia are Moslems. Living conditions in the land are still very primitive. The only good road runs between the towns of Jidda and Mecca. Other roads are little more than desert trails.

Before King Ibn-Saud organized his kingdom, wild Bedouin tribes wandered throughout the country. Tribal wars often set one group against the other. The growth of the Arab nationalist movement began to draw the people together. The vigorous efforts of King Ibn-Saud hastened the central organization of the scattered tribes. King Ibn-Saud remained supreme master of his kingdom. He stamped out tribal wars and began to modernize the living habits of his people.

**History and Government.** The history of Saudi Arabia is tied up with the growth of Arab nationalism in the Near East. Since the early 1900's, Arab leaders have

tried to set up a united Arab kingdom. The plan is known as the Pan-Arab project. Its purpose is to organize the millions of Moslems of Egypt, Palestine, Syria, Iraq, and Arabia. Thus far, only Saudi Arabia has been able to bring about such organization. Many Arab leaders look upon Saudi Arabia as the future capital of the Moslem world.

The growth of Saudi Arabia began after World War I. The Turks had been driven out of the country, and the Arabs were left to work out their own fate. King Ibn-Saud rose as leader of Arabia. He combined the territories of Hejaz and Nejd into the kingdom of Saudi Arabia. The kingdom still has two capitals, Mecca and Riyadh. During World War II, Saudi Arabia sympathized with the Allies, but the country did not enter the war until 1945.

The king of Saudi Arabia is the absolute ruler of the country. He has no state ministers, and there are no legislative bodies such as those in America or Western Europe. The government has a constitution which provides for advisory councils, but council members must be approved by the king.

G.B.C.R.

See also ARAB; ARABIA (Political Divisions of Arabia; map); FLAG (color plate, Flags of Asia); HEJAZ; IBN-SAUD.

**SAUERKRAUT.** See CABBAGE.

**SAUK**, *sawk*, was the name of a tribe of American Indians. They were also called the SAC. Most of the time the Sauk lived in Wisconsin, but they once camped and farmed for a while where Chicago now stands. Early white settlers wanted the rich land of this farming tribe. The whites made treaty after treaty with the Sauk, and then changed or went back on their agreements.

In 1832 the Sauk rebelled. They were led by their war chief, Black Hawk. This patriot hoped that all the American Indian tribes might unite against the white settlers who were taking their lands. But only a few of the Indians would follow him. Soon Black Hawk was defeated and taken prisoner.

**Natives of Saudi Arabia** tether their camels as they kneel in prayer to Mohammed on the sands of the desert. Although the

country has great oil resources and is being modernized rapidly, camels are still a common means of travel.

British Combine

Black Hawk's white captors had great respect for this dignified and devoted Sauk leader. They took him to Washington, where he met President Andrew Jackson and other important men. He was released after the white leaders had shown him the power of the United States. Today a huge statue of Black Hawk stands on the Rock River, at Oregon, Ill.

R.M.U.

See also BLACK HAWK; INDIAN, AMERICAN (Eastern Woodsmen; Table of Tribes).

**SAUL** was the first king of Israel. He was a peasant boy of the tribe of Benjamin. He reigned shortly before 1000 B.C. The story of Saul's life is told in the Old Testament (I Sam.: 9-31).

The Israelites wanted a king to unite and lead them in battle against their enemies. Samuel, the aged judge of the Israelites, chose Saul, and anointed him king. Saul immediately organized men for the defense of Jabesh, a besieged town in Gilead. The town was saved. Later Saul fought successfully against Ammonites and Amalekites. But his most important victories were over the Philistines. He helped unite the tribes during his reign and apparently ruled all the territory from southern Judah to the plain of Jezreel (Esdraelon). He was a strong and gallant leader.

Later Saul's health broke and he became moody. Often he was violent in his fits of anger. He grew to hate and envy the popular young warrior David. He even tried to kill him, but failed. Finally, in a great battle against the Philistines on Mount Gilboa, Saul was defeated. The Philistines gained all Palestine west of the Jordan. Three of Saul's sons were killed, including Jonathan, the close friend of David. Saul took his own life by falling on his sword. David's poem of lamentation upon the deaths of Saul and Jonathan is a touching one:

The beauty of Israel is slain upon thy high places!

How are the mighty fallen. (II Sam. 1:19- ).

See also DAVID.

W.A.I.

**SAUL OF TARSUS.** See PAUL, SAINT.

**SAULT SAINTE MARIE**, *soo saynt mah RE*, Ontario (population 25,794). Sault Sainte Marie lies on the Saint Marys River, which connects Lake Superior and Lake Huron. It was named for the falls or rapids in the river. The French word *sault* means falls. These falls now provide hydroelectric power for industrial plants making pulp and paper, steel, chemicals, lumber, and tar. Sault Sainte Marie was first a mission and then a fur-trading post. The International Bridge over the river near the city was completed in 1887. A modern canal was finished in 1895. (See SAULT SAINTE MARIE CANALS.) Sault Sainte Marie's industries grew, and a city charter was granted in 1912.

G.W.B.R.

**SAULT SAINTE MARIE CANALS** are usually called the Soo CANALS. One of the canals is in Michigan, and the other one is in Ontario. These canals were built to allow ships to pass between Lake Superior and Lake Huron. The Saint Marys River is the natural connection between the two lakes, but its rapids make it useless as a commercial waterway. The Soo Canals carry more tons of shipping than the Suez and Panama canals combined. Iron ore is the chief product carried by east-bound traffic, and coal is the leading product transported by west-bound traffic.

**The American Canal.** On the United States side, a railroad was first used to carry passengers and freight around the rapids of the Saint Marys River. The state of Michigan completed the first canal in 1855. The canal was owned by Michigan until 1881, and then its operation was taken over by the United States Government. This first canal had two stone locks. Each lock was 350 feet long, with a lift of nine feet. These two locks were destroyed in 1888 when ground was hollowed out for the Poe lock.

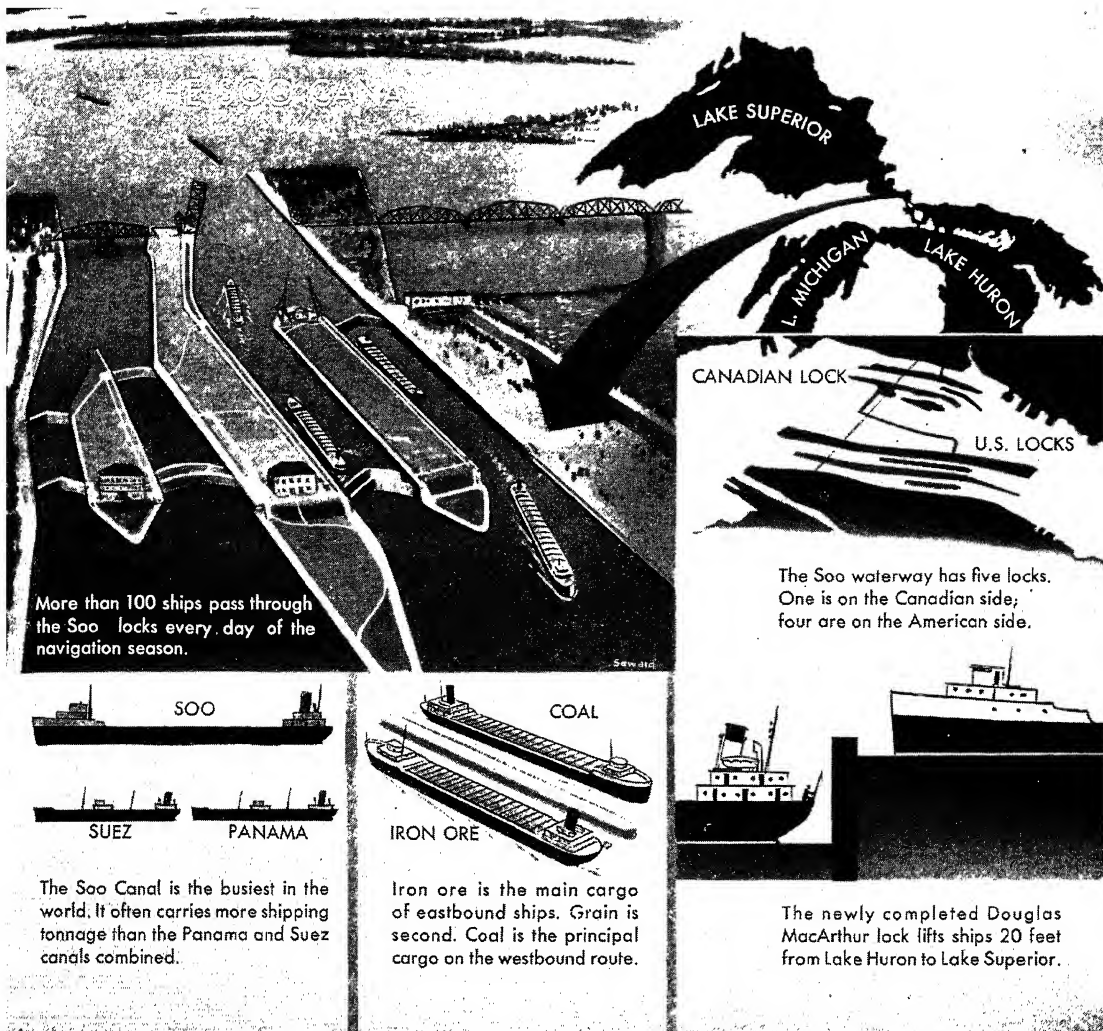
The Weitzel lock, since replaced by the MacArthur lock, was built under the direction of General Godfrey Weitzel (1835-1884). The Weitzel lock was 515 feet long, and had 16 feet of water on the sills. Sills are pieces of timber across the bottom of the lock. The gates shut against the sills. The Weitzel lock was completed in 1881 at a cost of \$983,335. The Poe lock is just north of the Weitzel lock. It was named for General Orlando M. Poe (1832-1895), the army engineer who was in charge of its construction. The Poe lock is 800 feet long, and has 22 feet of water on the sills. It was completed in 1896 at a cost of \$2,837,337.

In 1908 the United States Government began widening the old canal channel. That year, Lock No. 3, called the Davis lock, was begun. In 1914 a new canal was dug to the Davis lock, and the lock and the canal were opened in October, 1914. The Davis lock is 1,350 feet long between the inner gates. It is 80 feet wide, and has a minimum depth of 24½ feet on the sills. The canal to the Davis lock is 260 feet to 300 feet wide. The Davis lock is deep enough to allow the largest lake steamers to use the American canal. The lock is large enough to hold two steamers at one time. The construction of the Davis lock and the new canal cost \$6,200,000. The widening and deepening of the old canal cost \$4,400,000. In 1912 Congress authorized construction of a fourth lock, directly north of the Davis lock. This lock, named the Sabin lock, was built almost exactly like the Davis lock. The Sabin lock was not completed until 1919, due to delays caused by World War I. It is equipped to raise or lower ships a distance of 20 feet in eight minutes. The machinery of the locks is operated by electricity.

The MacArthur lock, named for General Douglas MacArthur, replaced the Weitzel lock in 1943. The MacArthur lock is the deepest of the four American locks. It is 800 feet long and 80 feet wide. This last lock, which also has a 20-foot lift, was built at a cost of about \$14,000,000.

**The Canadian Canal.** Early trappers had to carry their canoes and furs around the rapids of the Saint Marys River. In 1798 the Hudson's Bay Company completed a canal which allowed canoes to go up the river. This canal had one lock, which was 38 feet long, and 8 feet 9 inches wide. It had a lift of 9 feet. The lock was destroyed by American soldiers in 1814. The Canadian canal which is used today is one and three-tenths miles long, 150 feet wide at the surface, and 25 feet deep. The single lock is 900 feet long, and 60 feet wide. It has a lift of 18 feet. The canal is cut through Saint Mary's Island, on the north side of the Saint Marys River. The Canadian canal was begun in 1888, and completed in 1895 at a cost of \$4,935,809.

For many years the larger ships used the Canadian



canal because it was deeper than the American canal. Today the American canal is deep enough to handle the largest lake steamers. The total freight tonnage is divided almost evenly between the American and Canadian canals.

See also CANAL (with list); MICHIGAN (illustration, Memorable Events).

**SAUNDERS, RICHARD.** See POOR RICHARD'S ALMANAC.

**SAURISCHIAN,** *saw RIS kih an.* See DINOSAUR.

**SAUROPOD,** *SAW roh pod.* See DINOSAUR.

**SAUSAGE,** *saw sij,* is a food made of chopped and seasoned meat. It is usually pressed into a long round skin. The oldest known cookbook, dated about A.D. 228, speaks of sausages. They were eaten several hundred years before the time of Christ.

Sausage meat and sausages are important products of the packing industry. In many countries sausage is also made on the farm and at home. The meats used in sausage may be pork, ham, beef, bacon, veal, chicken, game, and in some countries, fish. Sausage is seasoned with various combinations of salt, black and red pepper, sage, garlic, onions, sugar, ginger, and mixed spices and herbs. Red wine is often used for coloring sausage

meats in European countries. Some sausages are sold raw, like fresh pork sausage. This is sold in short links or in the form of patties. Other sausages are cooked or smoked when they are manufactured, and are sold ready for the table.

Sausage meat may be stuffed into casings made from the intestines of farm animals, preferably sheep. After the casings are carefully cleaned, they are salted or soaked in brine. Artificial casings are sometimes used. Artificial casings were first made about 1916. In 1928 American chemists announced the invention of a sausage casing made from cellulose materials. Another method was found about 1930 to make sausage without casings. These became best known in the "skinless" frankfurter.

The frankfurter, named for Frankfurt in Germany, is the most popular sausage in the world. Frankfurters are sold under the nickname of "hot dogs," "red hots," or "wienies" at sporting events and amusement places in the United States. Some foreigners think hot dogs are one of the most typical characteristics of American life. Hot dogs are made of cured and well-smoked pork and beef.

More than a hundred kinds of European-style sau-



sages are made in the United States. Germany, Italy, and France once excelled in the making of famous kinds of sausage. American sausages may be classified as fresh, smoked or cooked, and dry sausages.

Sausages are good energy foods. They vary in fuel value according to content. The raw kinds are made ready for the table by boiling, frying, or broiling. Pork sausages should always be well cooked as a precaution against *trichinosis*, a disease caused by a parasite worm in some pork.

Following are descriptions of different kinds of sausage:

**Black Pudding** is made in Scotland of hog's blood, oat-meal, suet, and minced onions, with pepper and salt. The name comes from the French *boudin noir*. In France, garlic and beetroot leaves are used in these sausages. They are eaten as a French custom on Christmas Eve after midnight Mass. In Germany, this kind of sausage is called *blood pudding*.

**Bologna**, named for the city of Bologna in Italy, is made of finely chopped bacon, veal, and pork, and is sold ready to serve.

**Boudins Blancs** are French sausages made of white meat of chicken, yolk of eggs, onions, bread crumbs, salt and spices, mixed with cream or milk.

**Cervelat** is a dry sausage which was once made of animal brains. Now it is made of cured pork and beef, seasoned, and sold ready to eat. The English sausages called *saveloys* are the same as cervelat.

**Holsteiner** is made of equal parts of pork and beef, chopped coarse, and stuffed into ring-shaped casings.

**Liverwurst** is made of parboiled liver, grated and seasoned, and is sold either fresh or smoked, ready to eat.

**Lyons** is a French sausage made of pure ham.

**Mortadella** is a famous Italian sausage, made of pork and beef chopped very fine, with cubes of pork fat added, spiced, and stuffed into calf or beef bladders.

**Pork** is the popular link sausage, sold fresh, and cooked by frying or broiling.

**Salami** is a dry, highly seasoned sausage made of pork, beef, and bacon. Many kinds of salami are made in the United States. Italian, Kosher, Polish, and Hungarian salami are among the better known kinds.

**Thuringer** sausage is made mostly of pork. It is named for the German province of Thuringia.

**Wienerwurst**, or *Vienna sausage*, is like frankfurter, but with the ends cut off.

J.-A.-B.

See also **FOOD** (Favorite National Foods [Germany]).

**SAUTERNE**, *sah TURN*. See **WINE** (Types of Wine).

**SAVAGERY**, *SAV ij ri*. See **CIVILIZATION**.

**SAVAIL**, *sah VI ee*, **ISLAND**. See **SAMOA**.

**SAVANNA**, *sah VAN ah*, is any large area of land covered with tall, stiff grasses and clumps of trees. The grass on savannas grows in bunches and tufts and seldom forms a continuous cover of sod. Most savannas make good grazing for cattle. Many savannas lie between forests and deserts. A good example of this is the grasslands of the Sudan in Africa, which lie between the dense growth of the Congo and the great expanse of the Sahara desert region. Other savanna areas of the world are the llanos region of northern South America, the campos of Brazil, and the veld grasslands of South Africa. The great plains of North America and the steppes of Europe may also be called savannas. The savannas of central Africa are the homes of the big game of the world. The prairies of North America are rich agricultural regions. See also **LLANOS**; **PAMPAS**; **PASTURE**; **PRAIRIE**; **STEPPE**.

E.L. THU.

**SAVANNAH** is the name of the first steamship to cross the Atlantic Ocean using steam power. The *Savannah* sailed from Savannah, Ga., on May 24, 1819. She completed the voyage in twenty-six days during which she was driven by steam for 81 hours. The rest of the voyage was made under sail. She docked in Liverpool, England, in June, 1819.

J.J.F.

**SAVANNAH**, Ga. (population 95,996), is one of the chief southern ports on the Atlantic Ocean. Every year more than 1,400 ships from all over the world dock in the harbor of Savannah. The city is the chief naval-stores center in the United States (see **NAVAL STORES**). Large and small fishing vessels bring their cargoes to Savannah for trade and manufacture. The city is also the trading center for a large farming region, which produces crops worth \$42,000,000 a year. Savannah was



Ewing Galloway

**The Home of Juliette Low in Savannah, Ga.**, is the birthplace of the Girl Scout movement. In 1912 the first meeting of the Girl Guides was held in the drawing room of this brownstone structure. The Low home, built in 1847, is now the headquarters of the Georgia Society of Colonial Dames.

founded in 1733, and was the first settlement in Georgia.

**Location, Size, and Description.** The city lies about eighteen miles inland on the Savannah River. A thirty-foot channel connects it with the Atlantic Ocean. It is situated across the Savannah from South Carolina. Savannah is the second largest city in population in the state. It has thirty-six miles of water front. The plan of the city is different from that of most other American cities. It was built according to a design made by William Bull and James Edward Oglethorpe, the founder of the Georgia Colony. There are squares and large parks throughout the city. During World War II, Hunter Field, an army medium-bomber base, and Chatham Field, a heavy-bomber base, were near Savannah. Fort Screven stands at the mouth of the Savannah River. Camp Stewart, an antiaircraft training base, is about forty miles south of the city.

**Cultural Life.** Savannah is the home of Armstrong Junior College, Georgia State Industrial College for Negroes, the Chatham Academy, and the Telfair Academy of Arts and Sciences. The Savannah Public Library and the Georgia Historical Society, with its library in

Hodgson Hall, are well-known throughout the South.

**Industry and Trade.** All kinds of farm products are brought to the city's markets. More than \$18,000,000 worth of lumber is shipped from the surrounding region to Savannah every year. The most important manufactured products made in the city include wood pulp, paper bags, refined sugar, cottonseed oil, and fertilizer. Shrimp and prawn are canned in Savannah fish-products plants. More than 2,000,000 pounds of crab meat are sold here every year. More than 50,000 gallons of oysters are shucked in the city. Two of the South's five major railway lines have home offices in Savannah. The city has three airports.

**History.** Savannah was the chief colonial city and capital of the Georgia Colony until after the Revolutionary War. During that war it was captured by the British and held until the fighting was nearly over. General Sherman captured the city during the War between the States. Savannah is the county seat of Chatham County.

E.M.C.

**SAVANNAH RIVER.** This waterway forms a large part of the boundary between Georgia and South Carolina. The main stream is formed by the Tugaloo and Seneca rivers, which rise near the southern boundary of North Carolina. The rivers meet on the boundary of Georgia and South Carolina, a few miles southwest of Anderson, S.C. From this boundary point, the Savannah River flows in a southeasterly direction, and empties into the Atlantic Ocean through Tybee Sound. The Savannah River is about 450 miles long. A channel thirty feet deep has been dug from the ocean to the city of Savannah, a distance of 18 miles. Large ships can use this channel. Smaller ships can go up the river for a distance of 230 miles, as far as Augusta, Ga., which is a city of cotton mills.

L.D., Jr.

**SAVA, SAH vah, RIVER** is a branch of the Danube River in Yugoslavia. The Sava rises in the Carnic Alps, near the southern border of Austria. The river continues in a southeasterly direction for 450 miles. It flows through Yugoslavia to the city of Belgrade, where it joins the Danube. More than three fourths of its course can be used for water traffic, although in a few shallow places, shifting sand banks, and a changing current make sailing difficult. The Sava River flows through lands populated by three groups of people that make up most of the population of Yugoslavia. These groups are the Slovenes, the Croats, and the Serbs.

W.R.McG.

**SAVERY, SA ver ih, WILLIAM** (1721-1787). See FURNITURE (American Furniture).

**SAVIN, SAV in.** See JUNIPER.

**SAVINGS BANK.** The average wage earner, in the past, was usually unable to find a suitable place to invest his small savings. But the total savings of many wage earners may now be invested at a profit. Savings banks are set up to receive the savings of many small depositors. The banks are able to pay interest on the savings by profitably investing large amounts of savings money in other enterprises. The rates of interest paid on savings vary from one to five per cent. Interest is usually compounded each year.

Savings banks are organized under state laws which often limit the type of investment the bank can make.

Federal banking laws also regulate savings banks. The Federal laws are administered by the Securities and Exchange Commission, the Federal Reserve System, the Federal Deposit Insurance Corporation, and other agencies.

There are two classes of savings banks, *mutual* savings banks and *stock* savings banks. Mutual savings banks are owned by the depositors as a group and all of them share in the profits of the bank. Stock savings banks are owned by the men who hold stock in the bank. The profits of a stock bank are divided among the stockholders. Mutual banks in the United States have deposits totaling more than \$13,500,000,000, over half of which is invested in government bonds. Deposits are received from over fifteen million persons. The amount of money deposited in stock banks is not nearly so great, being of slight importance.

Daniel Defoe, the English author, is credited with originating the idea of the savings bank in 1697. But the Rev. H. Duncan of Ruthwell, Dumfriesshire, England, is called the "father of savings banks." In 1810 he founded a savings bank which took in \$5,800 in deposits in four years. The first savings banks in the United States were the Philadelphia Savings Society and the Provident Institution of Boston. Both institutions were founded to encourage people to save money. They were not operated as business enterprises as are the modern savings banks.

Two other types of savings banks are postal savings banks and school savings banks. These are not separate institutions, the former being run by the Post Office Department, and the latter as one phase of the business of a savings bank or savings department of a commercial bank.

F.A.Br.

See also BANKS AND BANKING; CREDIT UNION; POSTAL SAVINGS BANK.

**SAVONAROLA, SAV oh nah RO lah, GIROLAMO** (1452-1498), was an Italian friar, who is often claimed without warrant as one of the first martyrs of the Reformation movement. He was born at Ferrara of a noble family. In his youth he pursued humanistic,



Brown Bros.

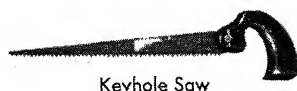
**Savonarola, fiery Italian** friar who was sentenced to death in 1498 as a heretic

philosophical, and medical studies, but developed a bitter distaste for worldly standards of life. He joined the Dominican order of the Roman Catholic Church at Bologna in 1474.

In 1482 Savonarola began his fiery speeches against the wickedness of the world. He went to Florence, then to Brescia, and back to Florence in 1490. In the following year he was elected prior of St. Mark's. His impassioned sermons denounced conditions in both Church

and State. He laid claim to prophetic inspiration and made predictions of special chastisements by God against Italy and the Church. However, his writings show he never gave up his allegiance to the Roman Church, Lorenzo de' Medici of the reigning house of

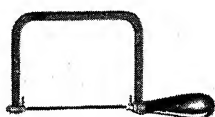
## TYPES OF SAWS



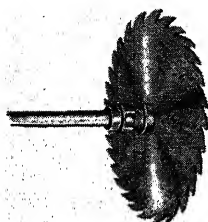
Keyhole Saw



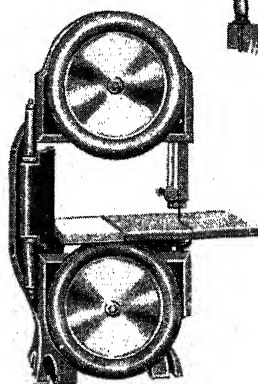
Hack Saw



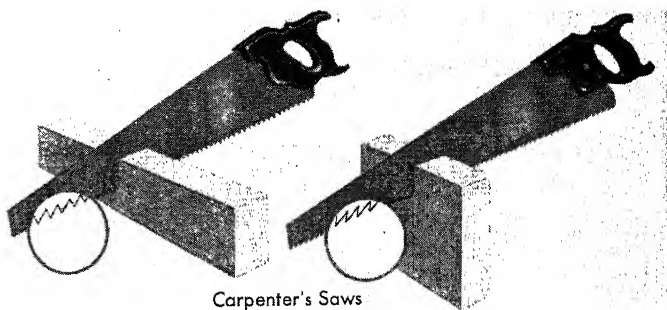
Coping Saw



Circular Saw



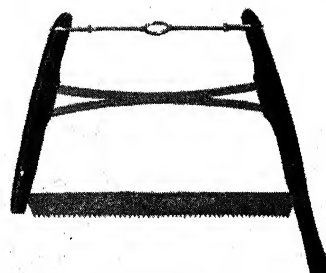
Band Saw



Carpenter's Saws

Crosscut Saw—cuts across the grain

Rip Saw—cuts with the grain

Lumberman's Two-Handed  
Crosscut Saw

Buck Saw

Florence tried unsuccessfully to win Savonarola over to his side. The story has come down that Savonarola refused to grant absolution to Lorenzo when he died. The invasion of Charles VIII of France hastened the collapse of the power of the Medici. And the Piagnoni, or democratic party, which came into power offered its support to Savonarola.

A great change came over pleasure-loving Florence while Savonarola continued his puritanical oratory. But he expected too much of the citizens. They eventually tired of his diatribes and deserted their leader. And because some of the friar's attacks were leveled at Pope Alexander VI, the latter finally excommunicated him. Savonarola declared the sentence null and void, but the Florentines were turned against him.

A Franciscan friar challenged Savonarola to prove the truth of his teachings by an ordeal by fire. The Pope counseled against an extravagance of this sort. Savonarola's enemies, who by now included the rulers of the city, seem to have arranged for the experiment, but finally to have prevented it from taking place. The fiery monk's life was then in constant danger. The mob demanded his arrest and trial for heresy. In prison he was mercilessly tortured. The records of the trial were falsified by his enemies, and he was condemned as a heretic. To the very end, he refused to recant; indeed, though disobedient to church authority he was clearly no

heretic. He was nevertheless hanged with two companions, and their bodies were burned, by order of the Signoria of the city. A small tablet in Florence marks the place of execution.

On the scaffold a bishop spoke the incorrect formula, "I separate thee from the Church militant and the Church triumphant." Savonarola's reply was, "Not from the Church triumphant; that is beyond thy power." The monk's life is portrayed in George Eliot's *Romola*. F.J.S.

See also ALEXANDER (Pope); DOMINICAN.

**SAVOY**, *sah VOY*, was, until 1946, the oldest reigning royal family in Europe. It was founded by Humbert, first Count of Savoy, during the 1000's. The family ruled a number of small Italian states, and played a leading part in unifying Italy during the 1800's. The House of Savoy lost the Italian throne after a popular referendum in 1946. See also HUMBERT II; VICTOR EMMANUEL. J.S.S.

**SAW.** This cutting tool is a metal blade having teeth set at an angle along one edge. Most persons know the ordinary handsaw, or carpenter's saw. But there are many different kinds of saws, made to cut through wood, stone, metal, or other materials.

*Circular saws* are used chiefly in lumber mills. They have teeth set in a round plate. These saws are often as large as seven feet across and are run by machinery. Circular saws can cut as much as 200 feet of wood a

minute, and can cut disc-shaped as well as straight pieces of wood. This kind of saw was invented by Samuel Miller in England in 1777.

**Band Saws** are flexible bands of steel with teeth. The band is looped over pulleys which are turned by machinery. The material to be sawed is pressed against the revolving band. This saw is used chiefly to cut barrel staves and thinner pieces of furniture. The band saw was also invented by an Englishman, William Newbury, in 1808.

**Crosscut saws** are chiefly used for cutting down trees. They are about eight feet long and have handles at both ends. The teeth are set so as to cut with both the backward and forward motion of the saw. The weight of the saw is enough to enable it to cut through the hardest woods, and no pressure has to be applied by the two men using it.

**Butcher's and machinist's saws** have very narrow blades of tempered steel with fine teeth. These saws will cut through very hard steel.

**Gang saws** are a number of saw blades parallel to each other and equal distances apart. These saws can cut a whole log to timber pieces of any desired size in one operation. The saws are set as far apart as the size of the boards to be cut. The sliding frame on which the logs are placed is moved forward against the saws. C.H.C.

**SAWBILL.** See MERGANSER.

**SAWFISH** is a fish that lives in the warm parts of the oceans and in some fresh coastal waters. It is a relative of the shark and the ray. The sawfish can be recognized by its long, flat snout that looks like a saw. The saw shark has a similar snout but can be told from the sawfish by the position of the gill openings. In the saw shark these slits are on the side of the neck. In the saw-



Ewing Galloway

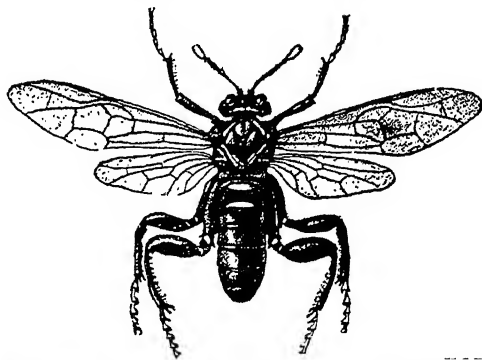
**Two Dangerous-looking Sawfish** caught in the Gulf of Mexico near Fort Myers, Fla. These fish have sharklike bodies and long snouts, with a single row of teeth on each edge. The slits above the eyes are breathing gills.

fish, which is a kind of ray, the gill slits are on the flat lower surface. The snout is sometimes six feet long. Each side of the snout has many sharp teeth like the teeth of a saw. These teeth are very sharp and are used by the sawfish to tear open the body of its victim. Because of its snout the sawfish is one of the most vicious of all fish of the sea. The sawfish also uses its snout to defend itself against bigger and stronger sea animals.

There are several species, or types, of sawfish. Many sawfish live in the waters along the southern coast of the United States. They make their way up the Mississippi River for many miles from the mouth of the river and do much damage to fishermen's nets. C.L.Hv.

**Classification.** The sawfish belongs to the genus *Pristis* in the family *Pristidae*. The commonest United States species is *P. pectinatus*.

**SAWFLY** is an insect that is related to the ant and bee and feeds on plants. The sawfly larvae eat the leaves and stems of plants and the adults lay their eggs there or in the trunks of trees. The eggs are placed in the



**The Sawfly Damages Plants** by depositing eggs on them. The larvae eat the leaves and suck the plant juices.

plant by a special organ called an *ovipositor*. The ovipositor of the sawfly is shaped like a saw. It cuts a groove into the stem or leaf of a plant. The eggs are then laid in this groove. As the egg develops into the larva stage, the food of leaf or stem is taken into the body of the insect.

The sawfly has four wings and a broad body. The mouth is shaped for sucking food. This insect pest of plants can be destroyed by spraying the plants with chemicals which contain arsenic. E.W.T.

**Classification.** The sawfly belongs to the order *Hymenoptera*. One species is *Neodiprion abietis*.

**SAWMILL.** See LUMBER.

**SAW PALMETTO.** See PALMETTO.

**SAWYER, RUTH** (1880- ), is an American storyteller and author of children's books. Her book *Roller Skates* tells about a year out of her own childhood. This book won the Newbery medal in 1937. She was born in Boston and grew up in New York City. She attended the Garlad Kindergarten Normal School in Boston, and then went to Cuba to help organize kindergartens. In 1904 she was graduated from Columbia University, where she studied folklore. In later years she gathered folk tales in Ireland and Spain. See also NEWBERY MEDAL. F.C.

## SAX, ANTOINE JOSEPH

**Her Works** include *Toño Antonio; Picture Tales from Spain; Year of Jubilo; This Way to Christmas; The Least One; and The Way of the Storyteller.*

**SAX, ANTOINE JOSEPH**, known as ADOLPHE (1814-1894). See SAXOPHONE.

**SAXE, MAURICE, COMTE DE** (1696-1750), was a German-born soldier who became a Marshal of France. He was one of France's greatest soldiers. Saxe was an illegitimate son of King Augustus II of Saxony. He served under the Duke of Marlborough in the War of the Austrian Succession. In 1744 he was made Marshal of France for his defense of Alsace. See also SUCCESSION WARS.

A.M.

**SAXE-COBURG-GOTHA**, *saks-KO boorg-GO tah*. See WINDSOR (the family).

**SAXIFRAGE**, *SACKS sih frij*, is the name of a group of hardy plants which often grow in stony soil and between rocks. They are popular plants for rock gardens. Long ago it was incorrectly believed that these plants caused rocks to split. They were therefore given the name *saxifrage*, which means *stone-breaking*. Saxifrages grow mostly in cold and temperate parts of the Northern Hemisphere. Many are beautiful plants that are grown in rock gardens for their leaves and flowers. They are also used as border plants and along walls.

Saxifrages grow to a height of two feet or less. Their flowers are usually white or yellow. The leaves may be mossy, leathery, or silvery, and are usually massed together at the base of the plant. The tiny seeds are enclosed in small capsules. One of the most common species is the early saxifrage, which has white flowers. P.C.S.

See also CURRANT; DEUTZIA; GOOSEBERRY; HYDRANGEA; SYRINGA.

**Classification.** The saxifrages belong to the family Saxifragaceae. The early saxifrage is *Saxifraga virginensis*.

**SAXON.** The Saxons were a Germanic people who invaded the island of Britain about fifteen hundred years ago. The Angles, another Germanic people, ap-

## SAXONY

peared in Britain at about the same time. The two tribal groups mixed and established the English kingdom and the Anglo-Saxon race.

The Egyptian geographer Ptolemy first mentioned the Saxons in a book he wrote during the A.D. 100's. Ptolemy described the Saxons as living in what is now Schleswig in southern Denmark. They were a warlike people and invaded Roman territory in the late 300's, during the reigns of the emperors Julian and Valentinian. By the 500's the Saxons had settled along the coast of Gaul, between the Elbe and the Loire rivers. They invaded Britain and settled there in great numbers, killing off the original inhabitants.

Charlemagne conquered the Saxons who remained in Germany, forced them to accept Christianity, and made their country part of his empire. The home of the Saxons was originally called *Saxony*. Saxony later became a kingdom of the German Empire, and then a state of the German Republic.

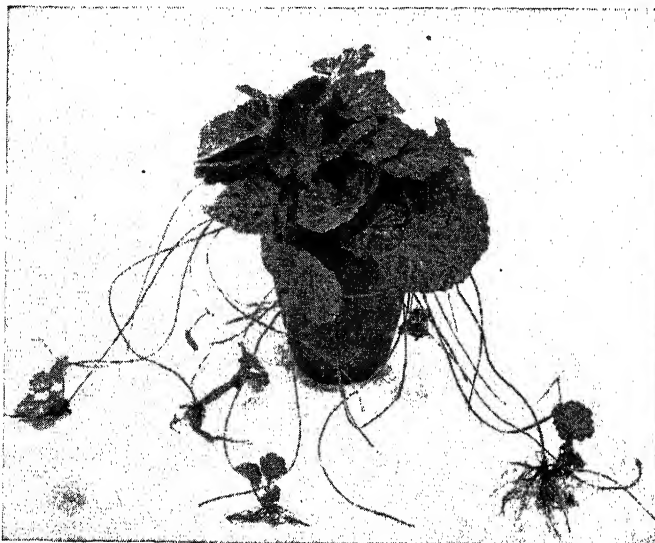
W.F.McD.

See also ANGLO-SAXON; CHARLEMAGNE (Other Conquests); GERMANY (map, Location of the German Tribes); SAXONY.

**SAXONY** is a province in eastern Germany. The German name for the province is SACHSEN. Saxony covers an area of 5,787 square miles, and has a population of 5,206,861. For the boundaries of Saxony, see GERMANY (colored map).

**The Land and Its Resources.** The southern part of Saxony is mountainous, but more than half of the land is suitable for farming. The Fichtelberg (4,000 feet) is the highest peak in Saxony. It rises in the beautiful Erzgebirge region. At the eastern end of the Erzgebirge lie the sandstone hills known as the *Saxon Switzerland*.

The Elbe is the only great waterway of Saxony. It enters the Erzgebirge near the eastern end, and crosses the state in a northwesterly direction. The climate of Saxony is mild and agreeable. There are many mineral springs. Forests cover about a fourth of the land.



J. C. Allen

**Strawberry Saxifrage** is a hardy and attractive plant in the home. Like the strawberry, it sends out long runners which form new roots.



Devereux Butcher

**Early Saxifrage** is among the first spring flowers. It blooms early in April.





**A Farmer of Lower Saxony** pauses for a rest as he mows the grain of his small farm with a scythe. He is wearing the traditional embroidered leather breeches of the region.

**The People.** Most of the people are of Teutonic stock, although there are a small number of Germanized Slavs. Among these are the Wends, who have lived in Saxony since early times.

Mining and manufacturing are the chief occupations of Saxony. The province has deposits of silver, coal, iron, lead, tin, and marble. Factories manufacture textiles, furniture, paper, watches, glassware, pianos, machinery, and many other commodities. Saxony is the chief textile-producing province in Germany, and has some of the country's largest iron mills. Saxony is also famous for its Dresden china, which is manufactured at Meissen.

The Erzgebirge region near the Czechoslovakian border has the poorest farming land in Germany. Most of the families here earn their living by small home industries. Many families of skilled Saxony craftsmen make music boxes, toys, and dolls in their homes.

The Saxon farms are small but highly developed. Wheat, rye, barley, oats, potatoes, and hay are grown. There are also orchards, vineyards, and flax fields.

Most of the people of Saxony are Evangelical Lutherans. Many of the schools of Saxony are world-famous. These include the University of Leipzig and the mining academy at Freiberg.

Saxony has some of Germany's greatest art collections, libraries, and museums. Raphael's "Sistine Madonna" was exhibited in the art gallery of Dresden, the Saxon capital. The Saxons are a music-loving people. Some of the world's greatest musicians were born in

Saxony. George Frederick Handel, Robert Schumann, and Richard Wagner were Saxons.

**History.** The name *Saxony* was originally given to a large section of northwestern Germany, which was the home of the great Low-German stock called Saxons. Charlemagne conquered the Saxons in a series of campaigns from 772 to 804, and their leader Wittekind became a Christian in 785. The original Duchy of Saxony was broken up in the late 1200's. In the early 1400's, the eastern part of the duchy fell under the rule of the Wettin family. The Wettins took many of the rights and titles of the former rulers of Saxony and applied the name *Saxony* to their territories. Saxony became a Lutheran stronghold after the Reformation, and was one of the most powerful German Protestant states.

Saxony was defeated by Napoleon in 1806, and then joined forces with him. As a punishment, more than half of Saxony was given to Prussia after Napoleon's final defeat. In 1849 a revolt in Dresden was suppressed by the Prussians. Saxony fought against Prussia in the Seven Weeks' War in 1866, but joined the new German Empire in 1871.

A republic was proclaimed in Saxony at the close of World War I, and a new constitution was adopted. Saxony suffered greatly during World War II. Its cities were heavily bombed and many factories were destroyed. Soviet troops occupied Saxony after the German surrender.

B.W.W.

See also DRESDEN; SAXON; SEVEN WEEKS' WAR.

**SAXOPHONE, SACK** *soh fohn*, is a single-reed wind



Pan-American Band Instrument Co.

**A Musician Plays the Deep-throated Baritone Saxophone**

instrument made of brass. It was invented by Antoine Sax, a Belgian instrument maker, about 1840. It combines the conical tubing of the cornet-type instruments with the single-reed tone principle of the clarinet. The saxophone was quickly put to use in military bands, and has taken an important place in modern concert bands and dance bands. It is a good solo instrument, and has been used in some important orchestral works, such as Bizet's *L'Arlésienne* Suite. Saxophones range in size from the little-used E-flat and B-flat sopranos to the contrabass in E-flat. The E-flat alto and the B-flat tenor are most commonly used. G.B.R.

**SCAB** (on apples). See **APPLE** (Diseases and Pests).

**SCABIES**, *SKA bih eez*, is a contagious disease also known as the itch, or psora. It is caused by the itch mite, an insect which bores under the skin. The disease brings severe itching, and scratching causes a skin inflammation called eczema. See also **MANGE**. A.B.H.

**SCAFELL**, *skaw FEL*, **PIKE**. See **ENGLAND** (Location, Size, and Surface Features).

**SCALARE**, *SKA lawr*. See **FISH** (color plate, Tropical Fresh-Water Fishes).

**SCALAWAG**, *SKAL ah wag*. See **RECONSTRUCTION** (Scalawags and Carpetbaggers).

**SCALDS**. See **BURNS AND SCALDS**.

**SCALE**. See **WEIGHING SCALE**.

**SCALE**. Scales are the thin, flat plates that form the outer covering of most fishes and of many serpents and lizards. The scales of the reptiles are hardened, horny folds of the skin. In most bony fishes, the scales are bony discs developed from the under skin. But sharks' scales bear enamel on the outer surface and bone on the inner surface. A few mammals are also scale-covered, such as the scaly anteater. Scales overlap one another like shingles, and form a protective armor for the softer body beneath. Scales vary in size, shape, and arrangement, according to the size and kind of animal they cover. The wings of butterflies and moths are covered with scales so tiny that they look like specks of down.

In botany, scales are little flaky leaves that cover buds on trees and woody plants in cold and temperate climates. These scales shield the buds from sudden changes in temperature. The regular pieces of a cone of an evergreen tree are called scales. L.B.A.

See also **SCALE INSECT**.

**SCALE**, in music, is a series, or "ladder" of tones belonging to any key. The simplest series within the octave of eight notes is the *major* scale. In the scale beginning on the key of C, for example, the major scale has five whole steps and two half-steps. The half-steps are found between three and four (E and F, or *mi* and *fa*) and seven and eight (B and C, or *ti* and *do*).

This scale does not use all of the tones within the octave, and if all the half-steps are counted, the octave contains twelve. A scale having all of these twelve tones is a *twelve-tone scale* if all are used equally, or a *chromatic* scale, if the five beyond the major scale are used for color (chromatic) purposes. The *minor* scale begins on the sixth tone of the major, or on A if the major scale is C.

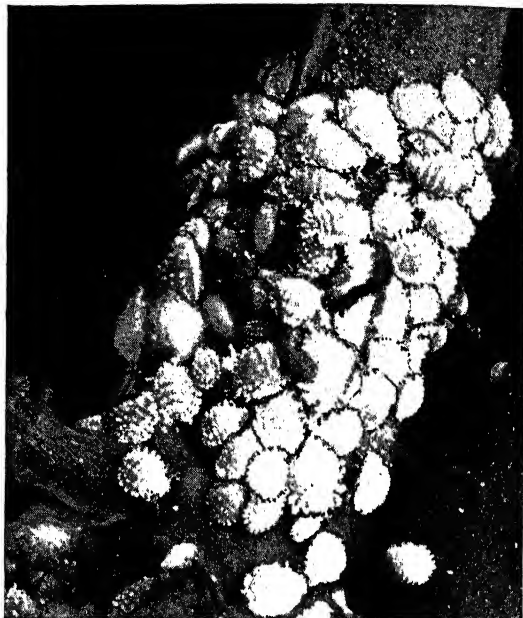
Some modern composers use a whole-tone scale, which leaves out all half steps. Many different kinds of scales were used in older music. Some countries still use

scales different from those used by European and American composers of the past 200 years. R.KEN.

See also **KEY**; **MUSIC** (Elements of Music).

**SCALE CARP**. See **CARP**.

**SCALE INSECT**, or **BARK LOUSE**. The group of scale insects includes several kinds that are very destructive to fruit plants. These insects receive their name because they secrete scales consisting of cast skin and waste matter. These scales form a body covering for the insect. They are sometimes white and powdery, and sometimes glassy or shell-like. The scale insects injure plants by sucking the sap. Of the 2,000 or more known species, nearly 400 are found in the United States. Often fruit



Cornelia Clarke

**Shells Given off by the Scale Insect.** The animal, often called the bark louse, does tremendous damage to fruit plants.

growers do not recognize them as insects, because they are so unlike most insects. The small black or brown spots sometimes seen on oranges are scale insects. There is one kind of scale in which the females look like small oak galls.

Probably the best-known of the group is the San José scale of California. This scale belongs to the most harmful division of the family. The adult females of the San José scale are a degenerate type of insect. They remain motionless during the greater part of their lives, and lack legs, wings, eyes, or antennae. Other common American scales are the cottony-cushion and the cottony maple scales, the scurfy bark louse, the pine-leaf and the rose scales, and the mealy bug. A small ladybird, imported from Australia, has been used to check the cottony cushion scale bug. Cochineal and lac are commercial substances that are produced by some scale insects. G.P.

See also **BIRD** (How Birds Help the Farmers); **COCHINEAL**; **LAC**; **SAN JOSÉ SCALE**.

**Classification.** Scale insects form the family *Coccidae* in the order *Hemiptera*.

**SCALLOP**, *SKAHL* *up*. The scallop, a bivalve mollusk closely related to the oyster, is one of the most popular of the shellfish which are used for food. They are world-wide in distribution and range from very shallow water to depths of over 1,500 fathoms.

The scallop shell is made up of two equal rounded valves which usually have fanlike, radiating ribs. At the hinge, where the ligament unites the two valves, there are two winglike projections called *ears*. The inside of the shell is lined with a membrane, the *mantle*. Each edge of this mantle is folded and fringed with slender tentacles and a row of eyes.

Scallops are very active, and swim by rapidly opening and closing their valves. When the large adductor muscle closes the valves the water between them is forced out in small jets alternately through openings near the hinge, thus pushing the creature forward in a zigzag fashion.

Several species of scallops live along the Atlantic Coast of North America. The most important of these is the *common scallop* which may be found in bays and inlets, south of Massachusetts Bay to the Gulf of Mexico.

The giant scallop, which is found from Labrador to North Carolina and especially along the coasts of Maine and Nova Scotia, may grow to four or five inches in width. It lives below the low water line. The large adductor muscle is the only part of the scallop that is sold for food. Scallop meat is soft and tender and tastes somewhat like lobster. It is considered a great delicacy.

Scallop shells have been used widely in conventional designs. In the Middle ages, pilgrims to the Holy Land wore scallop shells on their hats to show that they were on a pilgrimage. w.j.g.

**Classification.** Scallops are mollusks of the family *Pectinidae*. The common scallop of North America is *Pecten irradians*. The giant scallop is *P. grandis*.

**SCALP.** The scalp is the outer covering of the skull on which the hair of the head grows. The scalp is made up of a thick skin under which are many layers of fat and connective and muscle tissue. The thick skin protects the skull from blows upon the head. It particularly protects the cranium, which is that part of the skull covering the brain. The muscles under the skin allow the scalp to move over the skull. This looseness of the scalp tends to keep wounds from gaping widely and becoming infected. Wounds of the scalp often heal with great ease because of the unusually rich blood supply, but injuries to the scalp should be treated with care to prevent infection. Deep injuries that are neglected may cause such serious diseases as meningitis. See also **BALDNESS**; **DANDRUFF**; **HAIR**. A.B.H.

**SCAMMONY**, *SKAM* *oh nih*, is a twining, climbing plant which comes from Asia Minor. It has white flowers and thick fleshy roots that are usually two or

three feet long. A white, milky juice is taken from the roots and allowed to dry and harden in the air. It then forms a gum resin which is used in medicine. Its principal use is in preparing laxatives, for the resin is a powerful cathartic. See also **CONVOLVULUS**. H.N.M.

**Classification.** Scammony belongs to the morning-glory family, *Convolvulaceae*. Its botanical name is *Convolvulus scammonia*.

**SCANDERBEG**, *SKAN* *dur beg*, III. See **ZOG I**.

**SCANDINAVIA**, *SKAN* *dih NA vih ah*. The peninsula of Norway and Sweden is often called Scandinavia. But the term Scandinavia really refers to all lands where Scandinavian people live. These lands are Denmark, Iceland, Norway, Sweden, and Finland. *Fennoscandia*

is a term which is often used to describe Finland and the Scandinavian Peninsula. Many regions near the Baltic Sea are known as *Baltoscandia*, because their climate and customs are much like those of the Scandinavian countries.

The ancient Romans used the word *Scandia* to describe an island which they believed lay north of the Baltic Sea. The Romans evidently referred to southern Sweden, which is still known as *Scandia*. The Romans did not know that Scandia was connected with the mainland of Sweden. W.E.E.

**Related Subjects.** The reader is also referred to:

Co-Operative (Co-operatives throughout the World)	Food (Favorite National Foods)
Denmark	Iceland
Finland	Norway
	Sweden

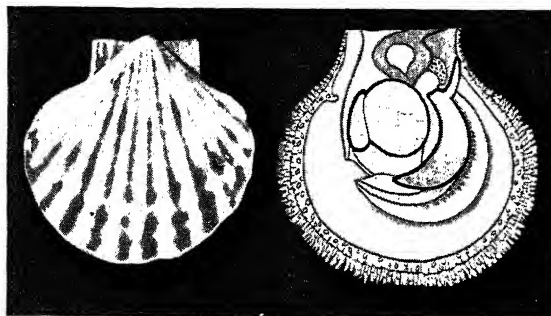
**SCANDINAVIAN LITERATURE** is rich in folk tales. Its history dates back almost a thousand years to the time of the *sagas*. The first of these were two *Eddas*, or heroic tales, in prose and verse from Norway and Iceland. The greatest of the sagas was the *Volsunga Saga*, the story of the Norse gods. From the time of the sagas to the 1700's, little outstanding literary work appeared in Scandinavia. Modern Scandinavian literature has given us a number of world-famous figures. Among these are the great dramatist Henrik Ibsen, the outstanding critic Georg Brandes, the novelist and poet Björnsterne Björnson, and the Nobel prize-winning novelists, Selma Lagerlöf and Sigrid Undset.

**Related Subjects.** The reader is also referred to:

Edda	Myth	Saga	Skald
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Brandes, Georg M. C.	Undset, Sigrid
Ibsen, Henrik	Zwilmeyer, Dikken
Lagerlöf, Selma	



The Shell of the Scallop and the internal organs of this tasty shellfish. The edible parts are outlined in black.

**SCANDIUM** (chemical symbol, Sc) is a metallic element which is sometimes considered a part of the group of rare-earth metals known as the aluminum group. The atomic number of scandium is 21, and the atomic weight is 45.10. Scandium is a gray metal which is found in combination with several rare-earth minerals. Scandium was first discovered in 1879 by the scientist Lars Nilson. This element has been found in Norway, Sweden, and Finland, and is named for the peninsula of Scandinavia.

G. L. Bu.

**SCAPA**, *SKAH pah*, **FLOW** is a sea basin, or sound, surrounded by the Orkney Islands off the north coast of Scotland. It is about fifteen miles long and eight miles wide. Scapa Flow became the headquarters of the battleship squadrons of the British Grand Fleet during World War I. On June 21, 1919, the defeated German Navy scuttled its remaining ships in the sound. In World War II, a German submarine sank the British battleship *Royal Oak* as it lay at anchor in Scapa Flow. See also **ORKNEY ISLANDS**.

H. U. S.

**SCAPEGOAT**, *SKATP gote*. Originally this meant one of the two goats which were received by the Jewish high priest on the Day of Atonement. One was for Jehovah, the Hebrew God, and was killed as a sin offering. The second goat was called the scapegoat. This was one for *Azazel*, which may have been the spirit of evil. The priest laid his hands upon this one, as he confessed the people's sins. The scapegoat was then sent into the wilderness. This was a symbol that the sins had been put away, or forgiven.

Today when a person is referred to as a scapegoat, it means he has been made to take the blame for something which is the fault of someone else.

L. L. M.

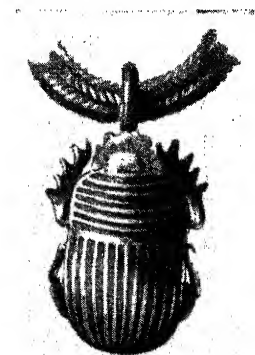
**SCAPULA**, *SKAP yoo lah*, in anatomy. See **BICEPS**.

**SCARAB**, *SKAR ab*. This beetle was held sacred by the ancient Egyptians. The scarab belongs to the family of dung beetles. Some of these beetles have the peculiar habit of breeding in refuse. They sometimes roll this refuse into small pellets which they roll to their underground burrows to be used

as food. Sometimes eggs are laid in the pellets. The Egyptians regarded the pellets as symbols of the world. Projections on the heads of the beetles were considered emblems of the rays of the sun. For the Egyptians, the scarab was also a symbol of the resurrection and of immortality. Figures of the insects were carved out of stone or metal and used as charms. Such figures were called scarabs. Usually the heart of a deceased person was removed, and a large carved scarab was put in its place in the body when it was embalmed. Many of these scarabs were richly jeweled.

G. P.

Oriental Institute, Univ. of Chicago  
**Gold Scarab Pendant** worn by Queen Ahotepe of Egypt, who reigned 2,500 years ago



**Classification.** The scientific name of the sacred scarab of Egypt is *Atenichus sacer*. Dung beetles belong to the large family *Scarabaeidae*; order, *Coleoptera*. Tumblebugs,



Cornelia Clarke

**Two Scarabs Rolling a Ball of Refuse** by pushing it with their legs. Scarabs often roll refuse into a ball and push it to their underground home, so it can be used as food.

June bugs, and Hercules beetles are other members of the family

**SCARCITY.** See **VALUE**.

**SCARIFICATION**, *SKAR ih fih KA shun*. See **TATTOOING**.

**SCARLATINA**, *SKAHR lah TE nah*. See **SCARLET FEVER**.

**SCARLATTI**, *skahr LAHT tee*, **ALESSANDRO** (1659-1725), was an Italian composer who is important in the history of opera. He founded the Neapolitan school of opera, and wrote about 115 operas, as well as at least 600 chamber cantatas. He was born at Palermo, Sicily. At the age of twenty, he conducted in Rome his first known opera, *L'Errore Innocenti*. Later he produced operas under the patronage of a number of the members of European royal families. His son, Domenico Scarlatti (1683-1757), became famous for his harpsichord sonatas, and has become known as the father of modern piano playing.

G. B.

**SCARLET CARNATION.** See **FLOWER** (color plate, Common Garden Flowers).

**SCARLET FEVER** is an acute infectious disease which attacks children most easily, especially those between the ages of two and ten. The highest death rate is among children under five. After that age, the older the child the less severe the disease. Scarlet fever is not so contagious as measles, but it spreads dangerously. Its after-effects are always dangerous to children. Among these may be damage to the ears, eyes, heart, and kidneys. Scarlatina is another name for the disease. Scarlatina is not a term for a mild case of scarlet fever, as is sometimes stated.

**Transmission and Symptoms.** Scarlet fever is caused by a germ, the *Streptococcus scarlatinae*. Live germs are carried in the discharges from the ear, nose, and throat of a patient who has the disease. Another person can catch the germs by touching the patient or by handling things that have been soiled with his discharges. Sometimes milk carries the germs.

The disease begins suddenly. An attack starts with vomiting, headache, fever, and sore throat. Within twenty-four to forty-eight hours, a rash appears on the neck and chest. It begins with tiny red spots which soon spread over the body. Another sign of scarlet fever is the appearance of the tongue. It is said to look like a strawberry. The rash usually starts to fade three or four days

after the attack has run its course. It is entirely gone in seven or eight days. Then the skin starts to peel, and continues to do so for two or three weeks. The scales may carry the germs, but ordinarily they do not.

**Treatment and Prevention.** As soon as an attack begins, the patient should be kept apart from other persons. He should stay in a quiet, well-ventilated room. The physician in charge will prescribe measures to control the fever and other symptoms.

In the control of scarlet fever the world owes much to Doctors George F. Dick and Gladys Henry Dick of Chicago. They proved that the cause of the disease was a bacterium of the streptococcus type. They also succeeded in filtering out the poison, or toxin, of this germ. They then inoculated a horse with the poison and produced an antitoxin from substances formed in the horse. The antitoxin is having good results in checking the disease.

The Dicks also performed an immunity test by injecting a small amount of toxin under the skin. The Dick test for scarlet fever is similar to the Schick test for diphtheria. It tells whether or not a person is likely to develop the disease if he is exposed to it.

Strict care is needed to keep a patient from spreading the disease to others. All discharges from his nose, throat, and ears, must be destroyed. His bedding and clothes must be thoroughly disinfected. The patient should be kept away from other persons until all discharges have stopped.

The Dicks and other experimenters are working to perfect a method of inoculation against scarlet fever. Many persons still catch scarlet fever. It has become a fairly mild disease, however, and the death rate from it is not high.

P.R.G.

See also **DICK TEST**.

**SCARLET HAW** is the most beautiful of the hawthorn trees in America. It is a small tree with crooked spreading branches, white flowers, and orange-scarlet fruits that ripen in late summer.

**SCARLET LETTER.** See **HAWTHORNE, NATHANIEL**.

**SCARLET RUNNER BEAN.** See **BEAN (Kinds of Beans)**.

**SCARLET SNAKE.** See **ANIMAL (color plate, Leading Groups in the Animal Kingdom)**.

**SCARLET Tanager.** See **Tanager**.

**SCARRITT COLLEGE FOR CHRISTIAN WORKERS** is a coeducational school in Nashville, Tenn. It is controlled by the Methodist Church and specializes in training social-religious workers. The college was founded in 1893. It has an average enrollment of about 250. H.C.S.

**SCAUP, skawp, DUCK.** See **Duck (Wild Ducks)**.

**SCENERY.** See **THEATER**.

**SCHACHT, shakht, HJALMAR** (1877- ), was a statesman and financier of Nazi Germany. As Adolf Hitler's Minister of Economics, he was in charge of preparing the German nation for war. His brilliant economic policies were in large part responsible for the long success of the Nazi regime, but Schacht always pretended to be opposed to the Nazis. When World War II ended he was tried at Nürnberg as a war criminal. But he was found not guilty and was set free. Soon afterward he was arrested for trial before a German denazification court.

Schacht, the son of a merchant, was born in Tingleff.

He was a brilliant student at the University of Kiel, and made such a name for himself in economics that he was given an important position with the Bank of Dresden. Schacht gradually advanced in banking circles until he became head of the Reichsbank. He was the German representative on the commissions which settled German reparations after World War I.

C.I.J.

**SCHAEFER, SHEH fer, METHOD.** See **ARTIFICIAL RESPIRATION**.

**SCHEELE, SHAY leh, KARL WILHELM** (1742-1786), was the Swedish chemist who discovered chlorine. He also prepared oxygen before Joseph Priestley did. But Scheele did not publish his work in time, and the English scientist was given credit for the discovery. Scheele was also the first to obtain pure lactic, oxalic, citric, tartaric, and hydrofluoric acids. He was born in Stralsund, and as a boy became a pharmacist's assistant. Scheele later opened his own pharmacy shop in Koping and made most of his discoveries there. See also **CHLORINE**.

B.J.

**SHEELITE, SHEEL ite.** See **TUNGSTEN**.

**SCHERHAZADE, sheh HAY rah ZAH deh,** was the legendary queen who told the stories in the *Arabian Nights*. According to the legend, she was the wife of the Sultan Shahriyar of the East Indies. The sultan made a practice of strangling his wives the morning after the wedding. But he spared Scheherazade because she entertained him with her interesting stories. See also **ARABIAN NIGHTS**.

S.M.S.

**SCHELDT, skelt, RIVER** is one of the most important commercial waterways of Europe. It is especially important to Belgium. It rises in the northern part of France, southeast of the city of Lille, and flows in a northeasterly direction through Belgium. When the river reaches Antwerp, in Belgium, it separates into two channels. These are known as the East Scheldt and the West Scheldt. The channels form two arms which flow into the North Sea. The Scheldt is 250 miles long. By means of locks, boats can sail over about 210 miles of its course. The river is connected with the Meuse and Rhine rivers by canals.

For 200 years the Dutch used the right to close the Scheldt to water traffic. In 1839, when the Treaty of Separation was drawn up between Belgium and Holland, Holland received permission to charge a toll, or tax, for the use of the Scheldt. Belgium succeeded in getting free navigation on the river in 1863. During World War I, The Netherlands closed the entrance to the Scheldt. This action led Belgium to file claims against The Netherlands at the Versailles Peace Conference. The question was settled in 1925 by a treaty between the two countries. During the German invasion of Belgium and The Netherlands in 1940, and during the German retreat in 1944, heavy fighting occurred along the Scheldt and the Albert Canal. The canal connects the Meuse and the Scheldt rivers.

W.R.McC.

See **BELGIUM (Rivers and Canals)**.

**SCHENECTADY, sheh NEK tah dih,** N.Y. (population 87,549), is sometimes called "the city that lights and hauls the world" because it has a huge electrical-manufacturing industry and an important locomotive concern. The city is also known as the "City of Magic" because of the important scientific work which is performed at the



research laboratory of the General Electric Company. This is the largest industrial establishment in the state.

*Schenectady* is an Indian name meaning *end of trail*. The site of the city was so named because it lay at the meeting point of Indian trails from the north, south, and east.

**Location, Size, and Description.** Schenectady lies in east-central New York, about 15 miles northwest of Albany, and about 160 miles northwest of New York City. Schenectady faces beautiful mountain ranges on three sides. The Adirondacks are on the north. The Green Mountains and the Berkshire Hills are on the east. On the south are the Helderberg and Catskill mountains. The Mohawk River flows eastward along the northern limits of the city. In the early days of Indian and pioneer life, Schenectady shared the Mohawk River's reputation as the "Gateway to the West."

Most of the homes in the city are of modern architecture. But old Dutch homesteads still stand in some sections of Schenectady. Scotia, a residential community, lies next to the city on the northwest. The two are connected by the Great Western Gateway Bridge across the Mohawk.

**Cultural Life and Recreation.** Schenectady is the home of Union College, which is one of the oldest colleges in the United States. It was founded in 1795. The city is the site of Schenectady County Historical Society and the Schenectady Museum.

There are twelve parks in Schenectady. Central Park, covering 156 acres, is the largest. Iroquois Lake lies inside the city. Thirty-seven recreation grounds are maintained by the city government.

**Industry and Trade.** The General Electric Company employs about 35,000 persons. About 10,000 persons work for the American Locomotive Company. Baseballs and golf equipment are important manufactures in Schenectady.

**History.** The site of the city was purchased in 1661 by Arendt van Curler and fourteen other Dutch pioneers. The Indians gave up all their claims to this land. Several years later they received in exchange belts of white wampum, six coats, thirty barrels of lead, and nine bags of gunpowder. The English took possession of Schenectady in 1664. In 1690 the settlement suffered from a terrible French and Indian massacre. Another bloody battle occurred in 1748. But the place was rebuilt and soon became an important trading post. Schenectady was chartered as a borough in 1765. It became a city in 1789.

W.E.Y.

See also GENERAL ELECTRIC COMPANY.

**SCHEVENINGEN**, *SKA ven ING en*. See HAGUE, THE.

**SCHICK**, *shik*, **BÉLA** (1877- ), is an authority on the diseases of childhood. He is best known for his development of the Schick test. This test, which he discovered in 1913, has become the accepted means of determining whether or not a person is likely to catch diphtheria. Schick was born in Boglár, Hungary, and studied medicine at Karl Franz University in Graz, Austria. Later he practiced as a pediatrician, or doctor of children, in Vienna, and came to the United States in 1923 as chief pediatrician at the Mount Sinai Hospital in New York City. Six years later he became an American citizen.

See also DIPHTHERIA; SCHICK TEST.

B.J.

**SCHICKLGRUBER**, *SHIK'l GROO ber*. See HITLER, ADOLF.

**SCHICK TEST.** This test for diphtheria immunity was introduced by the noted physician Béla Schick in 1913. A very small amount of the diphtheria toxin is injected under the skin. There is no effect if the person is immune to the disease, but the area around the injection becomes inflamed if he is not. Babies can be given the test to find whether they have inherited immunity. If not, they are generally given injections to immunize them. See also DIPHTHERIA; SCHICK, BÉLA.

P.R.C.

**SCHIFF, JACOB HENRY**

(1847-1920), was an American banker and philanthropist. He was born at Frankfurt-on-the-Main, Germany, and came to New York City in 1865. In 1875 he became a partner in the firm of Kuhn, Loeb & Company, and from 1885 was its president. He was a director in the Central Trust Company, the Western Union, and the Wells Fargo Company. With his large fortune he founded the Jewish Theological Seminary, the Semitic Museum at Harvard University, and the Nurses' Settlement in New York City. He also gave to many other charities.

**SCHILLER, SHIL' er, JOHANN CHRISTOPH FRIEDRICH VON** (1759-1805), was a famous German playwright and poet. Next to Johann Goethe he is considered the greatest dramatist of his time. Schiller was a master of dramatic construction and character portrayal and his plays have become classics of the theater. His plays are glorious pleas for human freedom and dignity. They inspired the German liberals in their fight for liberty during the early 1800's and in 1848.

Schiller was born in Marbach, in the duchy of Württemberg. As a boy he was forced to enter the Duke of Württemberg's newly established military school at Stuttgart. Later he studied law for a time but finally he decided to become a doctor like his father. Schiller developed an early interest in literature, and at seventeen he secretly began to write his romantic play *The Robbers*. This play caused a sensation

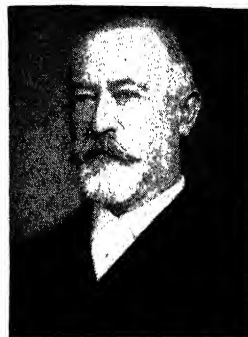


Brown Bros.

**Johann Schiller** was one of Germany's great poets.

when it was published in 1781.

In 1782 *The Robbers* was performed at Mannheim, in the principality of Baden. Schiller was now a surgeon in the army, but he determined to see his play even if he had to go in secret. But the military authorities arrested him when he tried to leave his regiment and put him in



Brown Bros.

**Jacob Schiff**, American financier and philanthropist

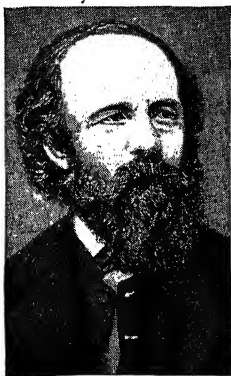
prison. On his release, he determined to escape the duke's tyranny and secretly crossed into the Palatinate.

Schiller became a subject of the Palatinate and settled in a little village where he could write undisturbed. Later he went to Mannheim, where he became poet for the local theater. Schiller then started work on his famous drama *Don Carlos* and went to Dresden for historical research. The play was presented at Leipzig in 1789 and brought him not only fame but also friendship with some of the greatest writers of Europe. Goethe admired his work and obtained for him the position of professor of history at the University of Jena.

For a time Schiller wrote only on scholarly historical themes, such as his famous *History of the Thirty Years' War*. In 1799 Schiller, influenced by Goethe, wrote his masterpiece, the historical tragedy *Wallenstein*. That same year he moved to Weimar and wrote several more verse dramas. In 1804, just before his death, he finished his most popular play, *William Tell*. P.M.B., Jr.

See also GOETHE, JOHANN W. VON.

**His Works** include the plays *The Conspiracy of Fiesco*; *Intrigue and Love*; *Maria Stuart*; and *The Maid of Orleans*. His prose works include some excellent historical studies and essays on art and literary criticism.



Brown Bros.

**Johannes Schilling**, noted German sculptor of Germany.

**SCHILLING, SHIL ling, JOHANNES** (1828-1910), was a German sculptor. Perhaps his most noted work is the large national monument to the Franco-Prussian War on the Niederwald, a mountain opposite Bingen on the Rhine.

Schilling was born in Mittweida, Saxony. He received his art education in Berlin, Dresden, and Rome. On his return to Berlin he received many commissions and made statues honoring William I, Otto von Bismarck, and many other noted persons F.Ho.

**His Works** include "Morning, Noon, Evening, and Night" at Dresden, and the "War Memorial" in Hamburg.

**SCHIPA, SKEE pah, TITO** (1890- ), is an Italian

tenor. In 1932 he became a leading member of the Metropolitan Opera Company. Schipa was born at Lecce, where he studied at the Lecce Conservatory, first as a composer. In 1911 he made a triumphant debut as a singer at Milan in *La Traviata*. He made his debut as a member of the Chicago Opera Company in 1919 and sang with that organization for thirteen years. Later he sang with the Metropolitan Opera Company of New York City. F.B.



**Tito Schipa**, Italian lyric tenor, famous in operatic roles

**SCHIPPERKE, SKIP er kih**, is a dog of The Netherlands and Belgium related to the spitz, chow, and samoyed. It has a short, sharp nose, pointed ears, strong chest, neck, and legs, and is generally born tailless. Its coat is thick and colored solid black. The schipperke is a small dog. Ordinarily it does not weigh more than eighteen pounds. See also DOG (color plate, Non-Sporting Dogs).

S.E.M., Jr.

**SCHISM, siz'm, OF THE WEST**. See POPE (Troubles of the Papacy).

**SCHIST, shist**. See GEOLOGY (Rocks are Remade).

**SCHIZOMYCETE, skiz oh my SEET**, is the name of a group of primitive plant organisms which have no chlorophyll.

**SCHIZOPHRENIA, skiz oh FREE nih ah**. See DISEASE, MENTAL; PERSONALITY (Split Personality).

**SCHLEIDEN, SHLY den, MATTHIAS JAKOB** (1804-1881). See BIOLOGY (History).

**SCHLESWIG-HOLSTEIN, SHLAYS vik-HOHL shline**, is a Prussian province which forms the most northerly part of Germany. It lies just south of Denmark, in the



Saebens-Worpswede, Black Star

**A Village Street in the Province of Schleswig-Holstein**

southern part of the peninsula which separates the North and Baltic seas. The Eider River divides Schleswig from Holstein.

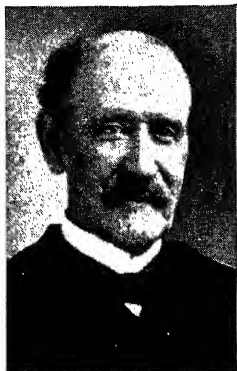
The province covers an area of 5,819 square miles, and has a population of about 1,520,000. The land is generally flat, with great moors inland from the seas. There are several good harbors on the eastern coast, where the shore is deeply indented. The chief rivers flow into the North Sea. Most of the people are farmers, and dairying is an important industry. The Kiel Canal crosses the province. The great German seaport of Kiel stands at the northeastern end of the canal.

Schleswig, a Danish dependency, and Holstein, a German dependency, were associated together under a single ruler in the late 1300's, and finally fell to the Danish kings. In 1864 Denmark surrendered the territory to Austria and Prussia. In 1866 Prussia took over the control of both provinces.

After World War I the people of Schleswig were allowed to vote on a union with Denmark. The northern zone voted to join Denmark, and the southern zone voted to remain with Germany. Denmark received that part of Schleswig which lies north of a line drawn west from Flensburg Fiord. The rest of Schleswig-Holstein became the present Prussian province. Schleswig-Holstein was occupied by the British at the close of World War II.

B.W.W.

See also KIEL CANAL; SEVEN WEEKS' WAR.



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**Winfield Schley** was an American naval hero in the war with Spain.

the War between the States. "Schley's Flying Squadron" was a noted unit in the Spanish-American War. Rear Admiral Schley retired in 1901.

C.L.L.

**SCHLEYER, SHLI** *er*, **JOHANN MARTIN** (1831-1912). See UNIVERSAL LANGUAGE.

**SCHLIEFFEN, SHLE** *fen*, **PLAN**. See MOLTKE, HELMUTH, COUNT VON.

**SCHLIEMANN, SHLEE** *mahn*, **HEINRICH** (1822-1890), was a German archaeologist. His discovery of the ruins of Troy and other ancient cities mentioned in Homer's *Iliad* was an important contribution to the world's knowledge of early Greek civilization.



Culver

**Heinrich Schliemann**, German adventurer who unearthed many ancient cities

Finally in 1868 he settled in Athens and spent the rest of his life in archaeological studies.

J.W.S.W.

**SCHMALKALDIC, shmahl KAL** *dik*, **LEAGUE** was an alliance formed by the early German Protestants to defend themselves against Emperor Charles V and the Roman Catholic states. The league was formed in 1531, and the War of the Schmalkaldic League followed. The

Protestants were defeated at Mühlberg in 1547. But the aims of the league were partly realized five years later in the Treaty of Passau. Charles V agreed to a temporary peace until a religious conference could settle matters more definitely. That conference took place in 1555 and is known as the Peace of Augsburg. Under its terms, both Catholic and Lutheran churches were for the first time legally permitted in Western Europe. See also REFORMATION (Reformation in Germany).

J.S.S.

**SCHNAUZER, SHNOU** *zer*, is a German dog much like the terrier, but it is stockier. It has shaggy eyebrows and muzzle, like the Airedale. The color is usually gray or black and gray. There are three separate breeds, based on size. The *miniature* schnauzer is about twelve inches high, the *standard* is fifteen to twenty inches high, and the *giant* is between twenty and twenty five inches high. See also DOG (color plate, Terriers).

S.E.M., JR.

**SCHNECKENBURGER, MAX** (1819-1849), a German poet who wrote *Die Wacht am Rhein*. See WACHT AM RHEIN.

**SCHNITZER, SHNIT** *zer*, **EDUARD**. See EMIN PASHA. **SCHNITZLER, ARTHUR** (1862-1931), was a famous Austrian dramatist, novelist, and short-story writer. Some of his work is gay and sophisticated. Others of his stories and plays are serious and melancholy. His style of writing is brilliant and clear, and the dialogue in his plays and stories is highly polished. His one-act plays are particularly noted. Schnitzler was born in Vienna. He studied medicine and practiced there.

E.L.C.

**His Works** include the plays *Anatol*, *The Green Cockatoo*, *The Lonely Way*, *Professor Bernhardi*; and the novelettes *Rhapsody* and *Fräulein Else*.

**SCHNÖRKEL, SHNAWR** *k'l*. See SUBMARINE (Development of the Submarine).

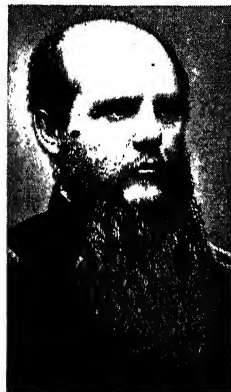
**SCHNORR VON CAROLSFELD, SHNOHR** *john KAH* *rols felt*, **JULIUS** (1794-1872), was one of a group of German painters of the early 1800's who tried to revive the Christian spirit of early religious art. They had much in common with the Pre-Raphaelite group of England. Schnorr is known for his frescoes in Rome and Munich and for his stained-glass windows in Saint Paul's Cathedral, London, and the Glasgow Cathedral.

**SCHÖFFER, SHUF** *ur*, **PETER** (1425?-1502?). See GUTENBERG, JOHANN.

**SCHOFIELD, SKO** *feeld*, **JOHN McALLISTER** (1831-1906), commanded the Union forces which captured Wilmington, N.C., during the War between the States. He also successfully defended Franklin, Tenn., in 1864. He was born in Chautauqua County, New York, and was graduated from the United States Military Academy. After the war he served as Secretary of War, and later was commanding general of the United States Army for seven years.

F.A.S.

**SCHOHARIE, skoh HAR** *ih*, **RESERVOIR**. See CATSKILL MOUNTAINS.



Brown Bros.

**John M. Schofield**, a general in the Union Army

**SCHOLARSHIP.** More than 61,000 students at institutions of higher education in the United States had scholarships during the term ending in 1941, just before the outbreak of World War II. These scholarships totaled nearly \$8,000,000 in value. Privately controlled institutions granted approximately 65 per cent of all scholarships.

The value in dollars and cents to students holding scholarships is difficult to estimate. Undergraduate scholarships ordinarily range from \$25 to more than \$2,500 annually. The average is about \$165. But an award of \$400 in a college which charges tuition and fees might be of no more help to a student than one of \$50 at a state university with low fees and no tuition charges.

**Scholarships in the United States** are granted by various organizations, colleges and universities, state boards, endowed foundations, and individuals. They are also available to servicemen under the Amended Servicemen's Readjustment Act, often called the G.I. Bill of Rights.

Endowed foundations and organizations usually grant funds for advanced scholarship and research. Such grants are called fellowships. Scholarships for undergraduate study are usually not granted to individuals by such organizations, but through universities or colleges. See EDUCATIONAL FOUNDATIONS AND ENDOWMENTS (with list).

Many state and private universities grant scholarships. Harvard University awards annual scholarships worth up to \$1,200 each to exceptional students throughout the country. New York state grants scholarships in place of having a state university. These are awarded to qualified residents of the state for study at approved institutions. The total annual awards amount to more than \$1,000,000 each year, exclusive of a still larger annual amount for veterans' scholarships. Some southern states have laws which require separate schools for Negroes. If adequate facilities for higher education are not available in the state, the Negro may receive a scholarship for study outside the state.

Scholarships are generally awarded as a means of selecting and training the most capable young persons in order that they may become an asset to the community and country. Some are established to promote study in a particular subject. Others are founded for personal reasons, and occasionally to satisfy some whim of the founder.

**Grants to Veterans.** Any qualified man or woman who served in the armed forces of World War II is eligible for a tuition and maintenance grant under the Amended Servicemen's Readjustment Act. Requirements call for at least ninety days of service and an honorable discharge. Grants are available for a period up to forty-eight months, depending on length of service. The applicant receives a maximum sum of \$500 for tuition and other fees during one school year, and a monthly allowance for maintenance. This amounts to \$65 if the applicant is single, and \$90 if he has one or more dependents. These grants may be used at any approved college, university, vocational, or trade school.

**International Scholarships.** A number of scholarships have been awarded to foreign students both by organi-

zations in the United States and in other countries. The purpose of such scholarships is to promote better international understanding, business, and diplomatic relations. The best-known are the Rhodes Scholarships. Several international scholarships are exchanged between the United States and Latin American countries. The Institute of International Education was organized to care for the interests of foreign students in the United States, and of American students at schools in foreign countries.

**Requirements for Scholarships** vary considerably, but in general a high standard of scholarship is called for, as well as good character. A student who wants to secure a scholarship should apply to the institution he wishes to enter to find whether scholarships are available. C.A.

See also FELLOWSHIP; RHODES SCHOLARSHIP.

**SCHOLASTICISM**, *skoh LAS tih siz'm*, was the philosophy of the schools of the Middle Ages. It represented an attempt to blend the beliefs of the Church with the philosophy of Aristotle, which the Jews and Moslems had restored to Europe. The greatest teachers of the scholastic method were those of the 1200's. Among them were Albertus Magnus, Roger Bacon, Duns Scotus, and Thomas Aquinas. Aquinas outlined the whole scheme of Roman Catholic theology in his great work, *Summa Theologica*. As a philosophical discipline, scholasticism has had a revival especially in Catholic circles since the late 1800's, when Pope Leo XIII made Thomas Aquinas the patron of all Catholic schools. The theological synthesis of scholasticism has undergone development in later Catholic teaching, but has never been supplanted.

A.E.H. and F.J.S.

See also ALBERTUS MAGNUS, SAINT; AQUINAS, SAINT THOMAS; ARISTOTLE; BACON, ROGER; DUNS SCOTUS, JOHN.

**SCHÖNBERG**, *SHUN berk*, **ARNOLD** (1874- ), is one of the most original of modern composers. He was born in Vienna, and studied with Alexander Zemlinsky there. Schönberg began his career with the composition of quite conventional music. His string sextet "Transfigured Night," which shows the influence of Wagnerian romanticism, attracted wide attention when it was first played in 1899.

But in the early 1900's Schönberg developed a new style in which he threw aside the traditional principles of composition and took up what is now called the "twelve-tone system." In this style, he made each note of a twelve-tone scale (like the chromatic scale) of equal importance, and did not depend on key as we ordinarily understand it. Schönberg's music seemed to listeners of that time, as well as to many later audiences, mechanical and unlike anything they had heard before. Riots frequently broke out in concert halls in which his works were played or sung. His early works included the *Chamber Symphony*, string quartets, and pieces for piano, and orchestra.

The composer lived for the greater part of his life in Vienna and Berlin. But in 1933, after Adolf Hitler came to power, he came to America and took a position on the faculty of the University of Southern California. Later he resigned because of old age and ill health. F.B.

**SHONGAUER**, *SHONE gou er*, **MARTIN**. See ENGRAVING (Origin of Engraving).

**SCHOOL** (of water animals). See BLACKFISH.

# SCHOOL



H. Armstrong Rober

**SCHOOL.** The word *school* has been used in the everyday speech of people since ancient Greek times. The word had a single, definite meaning when schools were simple and much alike. But today schools have become more complex and they differ greatly from one another. If the same word is to be used to describe all the various kinds of schools, it can have only a general meaning.

The true definition of school is that it is an institution set up for the purpose of teaching. But in order to teach, a school may have to do other things also. For example, in cold weather it may have to operate a furnace, and during the summer, it may have to make repairs on equipment. But these functions are only to promote the main purpose, which is teaching. There is a second and incorrect definition of school that is commonly used. It is that a school is the buildings, grounds, and materials used in teaching. These things are important parts of a school, but they are not an actual school in themselves.

**Early Schools** were often conducted without buildings. Examples include the ancient practice of teaching in the open air in the shade of a tree or a house, and more recently, the "hedge schools" of Ireland and other countries.

Early American schools were almost as simple and primitive as these. Among them were the log schoolhouses of the wooded parts of the United States and the sod schoolhouses of the plains.

About 1820, the people of Cleveland, Ohio, built a one-room schoolhouse. The labor, timber, and stone were given without cost but the nails, hinges, glass, and other manufactured articles had to be purchased. The total money spent was twenty-six dollars. Just a hundred years later the city of Cleveland erected a school building at a cost of twenty-six thousand dollars per room. In 1920, labor and building materials were more expensive than in 1820. But a great deal of the increase in cost was due to the improved construction and the enlarged facilities of the new school.

These factors — improved construction and enlarged facilities — are two of the most outstanding characteristics of the modern school. Schools vary in their type of

construction and number of facilities. But the average school of modern times is vastly different from the institutions of the 1800's or even the early 1900's.

**Improved Construction of School Buildings.** The population of cities began to increase rapidly about a hundred years ago, and the number of students in city schools grew steadily. Boards of education tried to provide for this increasing enrollment. They adopted building plans that would readily permit the addition of extra rooms. Such buildings were little more than a collection of classrooms connected by corridors. They often lacked an office for the principal, a teachers' room, cloakrooms for the children, and other necessary conveniences. The buildings were often made of wood. As land values rose, buildings four or more stories high came to be favored. These high, wooden buildings became a great fire hazard.

Later ideas of schoolhouse construction demanded that buildings be made as nearly fireproof as possible. In this field, experience was a harsh master. Many Ohio children lost their lives in the Collingwood school fire of 1908. After that disaster, many states passed school construction safety legislation, or strengthened what laws they had.

To eliminate fire hazards completely is difficult. But they can be greatly reduced by fireproof construction and by the erection of low, rather than high, buildings. Stairways are a menace to the health of students. They not only aid the spread of fire, but also serve as a source of accidents and take up valuable space. Newer buildings are kept down to one or two stories, if possible. Henry Barnard asserted that although land values in cities were constantly rising, "sky costs nothing. But," he added, "low buildings are to be preferred for reasons of health, safety, convenience, and from every standpoint other than the financial one."

**Buildings and Health.** New buildings are constructed to protect the health of the students. They provide living conditions at least as good and sometimes better than those found in the home. To do this they provide sufficient floor space, airspace, and window space. The windows are placed high, close together, and to the left



## SCHOOL

of the pupils. If windows must be placed on two sides of a room, they are placed on the left of the pupils and behind them. Modern science and architecture have produced schools that are well lighted by day. The buildings are also airy, comfortably warm at all seasons, and sanitary.

**Permanence.** Striving for safety and other worthy qualities tends to develop permanent buildings. But permanence may not be desirable. School buildings can not be too safe. But they may be built to last so long that they finally become outmoded. They must be adapted to the work that is to be done. New equipment that may lead to improved methods of teaching may be invented. Subjects, vocations, and social demands may change. All these and other factors may require new buildings. Buildings do not grow with the changing needs of children and of society. They should not be built to last forever. An old building may have solid foundations, massive walls, fine woodwork, and costly stone trim. It may seem too good to tear down. But if it was built many years ago, it may be as out-of-date as a buggy factory.

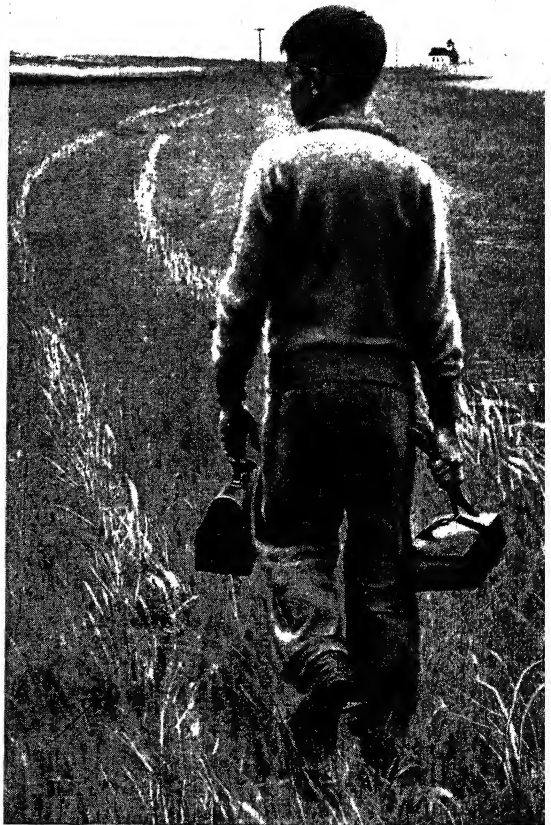
**Enlarged Facilities** of the better schools also show why many buildings are antiquated. The ideal modern schools have daily programs in physical education with facilities for outdoor and indoor activities. Outdoors there are playgrounds for small children. For the older children, there is provision for tennis, softball, football, track, and other sports. Indoors there are swimming pools, showers, a gymnasium, and perhaps a field house for track and basketball.

The best modern schools also have facilities for medical inspections. A health unit usually has a waiting room and examination rooms for eyes, ears, teeth, and general medical examination. Other divisions include a first-aid room, rest rooms with cots, and consultation rooms for visiting doctors, dentists, nurses, and psychologists.



Louis C. Williams

**The Oldest Wooden Schoolhouse in the United States** is in St. Augustine, Fla. It was built in 1778.



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The Saturday Evening Post by the Curtis Publishing Company

**Summer Is Almost Gone** as this farmer's son trudges on his way back to school along a grown-over wagon track.

Other indoor facilities may include a library with a reading room to accommodate at least one-third of the pupils at one time. The library has charge of its main collection as well as books and materials that are distributed for use in classrooms and by departments. The library is often directed by a professional school librarian. The up-to-date library also has an office, a periodical room, and a book-repair room. Under appropriate conditions, pupils should have access to the stacks. This demands a system that will prevent the loss and injury of library property. Many educators say that if grocery stores can solve the problem of self-service, school libraries should be able to do likewise.

Many new schools have soundproof practice and rehearsal rooms for band, orchestra, and chorus, and convenient storage space for instruments. Other schools are equipped to use the radio and the motion picture for instruction and entertainment. There are also manual-training shops for industrial arts such as woodworking, mechanics, and designing. In addition, many schools have studios for plays, painting, modeling, and other arts. They have laboratories for science and home economics, and rooms equipped for bookkeeping, type-writing, and other commercial studies. These facilities are but a few of the many present in the modern school.

The old school was merely a collection of classrooms connected by stairways and corridors. The new school is a functional building with many varied facilities. All the parts are fitted together to promote the bodily, mental,



Ewing Galloway

**Children of Bombay, India**, still use the old-fashioned slate in their schoolwork. The girl sitting at the left end of the bench

watches with interest as one of her classmates reads what he wrote before the beginning of class.

and moral health and growth of the pupils. The old school taught reading, writing, arithmetic, and a few other subjects. All studies were taught by means of language, spoken, written, and read. The new school teaches many things that the old school omitted, teaches them in new ways, and carries on many nonteaching activities, such as medical inspections, vocational guidance, and sports programs. The old school was like a shepherd's pipe on which only a few simple melodies could be played. The new school is like an orchestra which can interpret the world's great music.

The best new schools are closely related to the life of the community. Students learn about their community by means of interviews, excursions, surveys, speeches by citizens with special knowledge, and reading. The local community offers fields of study in local government, police work, public health, housing, slum areas, racial prejudice, or work and wages. The modern school likewise serves the men and women of its community.

It is a center for adult education, for community forums, and for athletic, dramatic, and other forms of recreation. The auditorium, gymnasium, athletic field, cafeteria, shops, and other equipment are used in the interest of all the people.

**School Expenses.** Many schools, however, still do not have adequate equipment. The laws of every state demand that all its children shall be offered a certain

minimum of education. A school district may go above this minimum, provide for a longer term, or pay better salaries than the law requires. But it is not allowed to provide less than the legal minimum. This legal minimum serves to protect the students in the poorer districts from inadequate education. But the legal minimum is sometimes too low.

Many schools are poorly equipped because the people are not able or not willing to meet the necessary expenses. The yearly cost of sending a pupil to school increased from less than eighteen dollars in 1870 to about a hundred dollars in 1940. The cost has climbed even higher since World War II. It is now five or six times as great as it was seventy-five years ago. Some districts find it difficult to meet the costs of good schools. Others fail to understand or refuse to accept the educational aims which the better schools in modern times have adopted.

School costs are high for still another reason. More pupils go to school and stay longer than they formerly did. School enrollments have increased rapidly in the last fifty years, and especially in the last twenty-five years. The greatest increase is in the number of students who attend high school. In the last fifty years, elementary-school enrollments have increased only one and one-half times, or from fourteen million to twenty-one million pupils. During the same time, secondary- or high-

school enrollments have increased about twenty times, from one third of a million to six and one-half million or more. Schools for such a vast number of students would be expensive even if they were kept as simple as good education would allow. It is hard to say where necessities end and luxuries begin. Communities differ. Probably in most communities, ornate doorways, marble foyers, paneled offices, and pipe organs should be considered luxuries in a high school. But there are many elementary and high schools at the other extreme that do not have even healthful, favorable buildings.

The elementary schools and the high schools are the most numerous of the public schools. But they do not include the whole range of public schools. Below the elementary school there is a small but growing number of nursery schools. These schools are operated for children of the age of two or three years. In cities there are many kindergartens which admit children of the ages of four and five years. Above the high school there are public junior colleges which usually offer two years of college work to high-school graduates. Teachers' colleges and normal schools, land-grant colleges, and state universities complete the American public-school system. Polytechnical schools teach technical subjects and applied sciences. These schools

prepare their students for most of the major and many of the minor professions, or else offer a liberal education to the general public.

**Public Schools.** One of the earliest American institutions of learning was the *dame schools* of the colonial period. They were organized and taught by women. The organization of the public-school system today has three noteworthy features. The first feature is the comprehensive or extensive variety of courses offered. Above the elementary-school level, each school has at least several curriculums, or courses of study. A large high school provides one curriculum that will emphasize English studies, another foreign languages, others music, home economics, commercial studies, or industrial arts. Students from all different social classes are taught in the same school and often in the same courses. In addition, students may choose a limited number of courses of their own selection, under the system called *elective study*. It is a system that is not usually duplicated in other countries. American universities are also comprehensive. They have schools of law, medicine, commerce, engineering, liberal arts, graduate studies, journalism, nursing, dentistry, and others, all on the same campus.

The second feature of the American public-school system is the credit plan of promotion. In schools above the elementary grades, the courses which make up each

curriculum are taught in separate units. The student receives the appropriate number of hours of credit for each course when he has completed it satisfactorily. The student is graduated when he has accumulated the required number of credit hours in his curriculum.

The third feature is the ladder arrangement of the schools. The elementary school prepares the student for the high school and this in turn is the ladder rung that leads to the next higher institution. Nothing prevents the students from climbing upward from rung to rung. They are required only to complete the designated courses in each grade and in each type of school. Schools throughout the country attempt to maintain the same standards. These standards allow a student to

transfer from one school to any other of the same kind, even though the two schools may be in different parts of the country.

**Private Schools** are also an important part of the American educational system. They differ from public schools chiefly by the manner in which they are controlled. Public schools are controlled by civil agencies, usually by boards of education. Elementary and high schools are controlled by elected boards representing the local school district, or by boards appointed by local governments. Land-grant colleges and state universities are

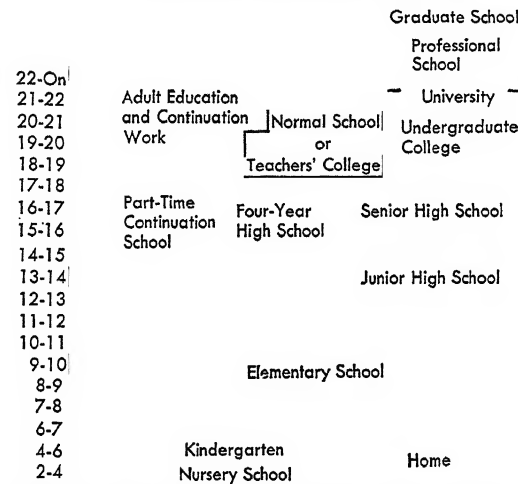
controlled by boards representing the state. National schools, such as the United States Naval Academy at Annapolis, are governed by national authorities. In addition, government schools are operated by the Federal Government in many United States territories and possessions.

On the other hand, private schools may be controlled by a church body, a corporation, a labor union, or any organized society. Or they may be independent schools. Lutheran, Methodist, Roman Catholic, and other church bodies conduct many schools. The University of Notre Dame, for example, is conducted by the Congregation of the Holy Cross of the Roman Catholic Church. Church schools are often similar to the public schools except for their religious connection and instruction.

Independent schools are usually controlled by separate boards, or individuals. These schools are the most completely private of all. In modern times, many business colleges are privately owned. Independent private schools frequently operate under a charter granted by the state. According to the decision of the Supreme Court in the Oregon case of 1925, no private school can be abolished by law.

Nearly all public and some private schools are day schools. A day school is so called because children live at home and attend school only during the day, instead

### TYPES OF AMERICAN SCHOOLS



Adaption from "Comparative Education" by I. L. Kandel; Houghton, Mifflin Co.

of living at the school, as is done at a boarding school. Since 1900, a number of private "country day schools" have been founded in the suburbs of larger cities. The purpose of these schools is to provide smaller classes and more varied programs than the public schools offer. The Shady Hill Country Day School of Germantown, Pa., founded in 1912, is an early example of these schools.

The most famous private schools are boarding schools. Their pupils live in the school during the school year. Two of the oldest and best known of these schools are the two Phillips academies, one at Andover, Mass., and the other at Exeter, N.H. Many private boarding schools are military academies and academies for girls. In all, there are several thousand independently operated private schools.

Some private schools emphasize the fact that they give individual attention to their students. The schools maintain small classes for instruction, and are able to secure the services of many especially able teachers. Some provide military discipline or claim particular success in character education. Many offer exceptional athletic opportunities including horseback riding, hockey, polo, skiing, and mountain climbing. Some maintain summer camps or conduct winter sports carnivals. A noted school for girls advertises badminton courts, bowling alleys, and both an outdoor and indoor riding ring.

Some private schools are located on large estates with bridle paths and maintain private stables of riding horses. In several schools, each student owns his own horse. Some ranch and desert schools are operated for pupils whose health requires them to spend much of their time in the open air. Others provide a haven for the children of broken families or of parents whose business or pleasure keeps them from establishing a settled home. Some are elementary schools, others are junior colleges, but the great majority are secondary schools. The private secondary schools enroll about 6 per cent of all secondary-school pupils in the United States. Most of the students come from wealthy families, as private schools are usually expensive. But the schools are a striking feature of American education. They are more important than the numbers of their students might indicate. There may be some snobbery, display, and frills in private schools. But many of them do work of a quality that public schools can not always equal.

**Guidance and Research.** Schools teach and try to develop character, and to promote health. They also give guidance, which is an important part of all education. Students receive guidance assistance for life, for further education, and for vocation. Example and instruction furnish guidance even when it is not directly given. But there has been a definite guidance movement in American schools since 1908, when Frank Parsons opened a vocational-guidance bureau in Boston. Modern schools often provide special guidance officers and staffs. Tests are given to discover special interests and aptitudes of students. Life histories of the pupils are compiled. Orientation courses are offered and information is given about vocational and personal needs and opportunities. This instruction aims to help pupils to make wise choices in important matters and to choose a life work.

Schools teach what is known and believed. But what is now common knowledge was not always known. Modern society knows a great deal about growing hybrid corn, producing penicillin, and building airplanes. These products and the approved ways of producing them have been developed only recently. Not many years ago they were wholly unknown.

Schools engage in research because they wish to teach more knowledge and more useful and better knowledge. Schools, especially those of the higher grades, devote a portion of their resources to the advancement of knowledge and the improvement of life through increased knowledge.

Teaching is the primary duty of the school. But teaching is useful only if it gives the guidance that leads to wisdom. Greater wisdom can come only from broader and deeper understanding. H.G.G.

**Related Subjects.** For information on schools of a particular country see the country article. Example, FRANCE (Education); GERMANY (Education). The reader is also referred to:

Academy	Parochial School
Conservatory	Platoon School
Consolidated School	Preparatory School
Education (with list)	Safety (Safety at School)
Elementary School	School Garden
High School	Theater (School Theater)
Junior High School	Theater
Kindergarten	Universities and Colleges (with list)
Lunch, School	
Nursery School	
Parents and Teachers, National Congress of	

#### Questions

What is the true definition of a school? What functions besides teaching must schools sometimes carry on?

What are the chief types of schools included in the public-school system?

What are the three main features of the organization of the public-school system?

What is a day school? A boarding school?

What are the two most outstanding characteristics of the modern school?

What condition caused a rapid increase in school enrollment a hundred years ago?

What event called national attention to the need for fire prevention in construction of school buildings? What steps are now taken to provide fireproof school buildings?

How does the course of study of the modern school differ from that of the old-fashioned school?

How much does a state have to say about what shall be spent for education in that state? How has the yearly cost of sending a pupil to school changed in the United States since 1870?

In the last fifty years, how much increase has there been in elementary-school enrollment? In secondary-school enrollment?

**SCHOOL, MILITARY.** See MILITARY SCHOOL.

**SCHOOL BAND.** See BAND.

**SCHOOLCRAFT, HENRY ROWE** (1793-1864), was a noted authority on American Indians. His writings did much to arouse interest in Indian affairs. His last and greatest work was the six-volume *Historical and Statistical Information Respecting the History, Condition, and Prospects of the Indian Tribes of the United States*, which he published between 1851 and 1857.

Schoolcraft was born in Albany County, New York, and studied geology at Union and Middlebury colleges. He developed his interest in Indians while on geological expeditions in Missouri and Arkansas. Between 1836 and 1841, he was superintendent of Indian affairs for Michigan and made a number of treaties with the Chippewa Indians.

J.W.Sw.

**His Works** include *Notes on the Iroquois; Oneota; and Algic Researches*, a study of Indian mental habits.

**SCHOOL DISTRICT.** See **SCHOOL** (School Expenses).

**SCHOOL FOR FLIGHT SURGEONS.** See **AVIATION MEDICINE** (Organizations).

**SCHOOL GARDEN.** In many schools the students raise vegetables and flowers as part of the school program. Several different school gardening plans have proved successful. Where there is room around the school building, gardens have been grown as group projects. Each pupil can have his own plot or he can work with others on larger plots. Some gardens have combined both of these plans. A different plan, used in Cleveland, Ohio, is a home gardening project for school children. Instruction in gardening is given in science classes. Teachers or other experienced persons visit the homes several times during the summer to follow the work and give help.

Textbooks in school gardening have been published by the National Education Association. There are elementary and advanced texts, with teachers' manuals. Careful planning is important in any kind of school garden. Pupils may pay a small fee to cover the seeds, fertilizer, and other supplies. The seeds are usually furnished at the school. Special seed collections have been prepared for the home type of garden. The collection should be small and simple, with seeds of plants that do not need expert care.

During World War II, school gardens of all types became Victory Gardens. Here the students used their lessons in agriculture to raise the extra vegetables needed in wartime. But the lessons from gardening are important at all times. Even beginners learn to plan and lay out a garden, prepare the soil, and plant the seeds at the right season. One school sent soil samples to the state agricultural institute for analysis. The students then studied the reports that were returned. There are other lessons in thinning and weeding, fertilizers, insect pests, weather, and harvesting. Student gardeners learn how plants grow and take their first steps in the science of biology. A garden also teaches a student to be responsible for his part of the job, and gives him the feeling of being a citizen.

One school which had grown a flower garden ended the season with a school flower show. The Cleveland schools have a harvest show in September. Besides the prizes for the best plants, badges or certificates often go to all students who have stayed with the garden to the end.

F.F.R.

See also **GARDENING**.

**SCHOOL LIBRARY.** See **LIBRARY**.

**SCHOOL OF AVIATION MEDICINE.** See **AVIATION MEDICINE** (Organizations).

**SCHOOL OF FOREIGN SERVICE.** See **GEORGETOWN UNIVERSITY**.

**SCHOOL SAFETY PATROL.** See **SAFETY** (School Safety Councils).

**SCHOOL SAVINGS BANK.** See **BANKS AND BANKING** (School Savings Banks).

**SCHOONER, SKOON** *er*. See **YACHTING**.

**SCHOPENHAUER, SHOH** *pen HOW* *er*, **ARTHUR** (1788-1860), was a noted German philosopher. He is known as the philosopher of pessimism. To Schopenhauer life was a curse of endless craving and endless unhappiness. Pleasure is not happiness, but merely the momentary satisfying of desire. To secure happiness, he believed, men must give up all their desires and try to reach a condition of denial similar to the Nirvana of Buddhism. (See **BUDDHIST**.) Schopenhauer believed that the only reality in the universe is a blind universal force he called "will." But the "will" seemed to him to be often unreasonable and irresponsible, and so he decided that things will never improve.



Brown Bros.

**Arthur Schopenhauer**, one of the foremost philosophers of the 1800's

Schopenhauer, the son of a rich banker, was born in Danzig. In 1809 he began to study medicine at Göttingen University, but later took up philosophy instead. He was graduated in 1813 and visited Johann Goethe at Weimar. There he began his studies of Oriental philosophies which greatly influenced his work. Schopenhauer later moved to Dresden, where he wrote his greatest work *The World as Will and Idea*. The idealistic philosophy of Georg Hegel was sweeping Europe at that time and Schopenhauer's book was not appreciated. He moved to Frankfurt-on-the-Main, a bitter man, and spent several years in retirement. People did not begin to appreciate his work until late in his life.

B.B.

**SCHOTTISCHE, SHOT** *ish*, is the name of a German round dance, popular in the 1800's. Its hopping and sliding steps are in  $\frac{3}{4}$  time. It is similar to the polka, but slower.

**SCHOUTEN, SKOU** *ten*, **ISLANDS** are possessions of The Netherlands. They lie directly north of Netherlands New Guinea in the Pacific Ocean. The total area of the islands is 6,760 square miles. Biak and Soepiori are the chief islands. The islands have a population of about 312,000. Most of the people are Papuans. The chief exports are dammar, trepang (sea cucumbers), shell, ebony, ironwood, and cane.

Japanese troops occupied many areas of the Netherlands Indies during World War II. But the Schouten Islands remained in Dutch hands throughout the conflict.

E.E.E.I.

**SCHRÖDINGER, SCHRUH** *din* *er*, **ERWIN** (1887- ), is an Austrian physicist. He was born in Vienna, and was educated at the University of Vienna. In 1933 he won the Nobel prize in physics for his mathematical development of the quantum theory of light. He formulated a single mathematical equation called "Schrödinger's equation" which helped solve many difficult





One of a series of events in the lives of immortal composers, painted for the Magnavox Collection by Boris Chaliapin and eight songs a day were not unusual for Schubert. "When I finish one, I begin another" he explained to his friends.

problems in atomic structure. Schrödinger taught in Switzerland and Germany and later became professor in the Royal Irish Academy and at the Dublin Institute for Advanced Studies. In January, 1947, Schrödinger announced that he had succeeded in integrating Albert Einstein's theory of relativity with the study of electromagnetic radiations such as radio, light, and X rays. See also NOBEL PRIZES; QUANTUM THEORY. R.D.R.

**SCHUBERT, SHOO bert, FRANZ PETER** (1797-1828), was an Austrian composer. Franz Liszt called Schubert the "most poetic musician that ever lived." Many of Schubert's songs, such as "The Erlking," "Hark, Hark, the Lark," "The Wanderer," and "Serenade," have few equals in melody and charm.

Schubert was born in Vienna, a member of a musical family. He learned the fundamentals of piano and violin playing at home. When he was fourteen years old he began to compose, and wrote some of his most celebrated songs when he was only nineteen. He never received much money for his efforts, nor did the public recognize his genius during his lifetime. None of Schubert's compositions was published until 1821, and he had to spend much of his time teaching to make a living. He died at thirty-one from overwork and from his bitter fight against poverty and disappointment. *Blossom Time*, an operetta by Sigmund Romberg, effectively tells the story of Schubert's life. A number of Schubert's most charming melodies are heard in this operetta, whose theme song is a variation of his *Unfinished Symphony*. It is called "Unfinished" because it has just two, instead of the usual three or four, movements of the classical symphony.

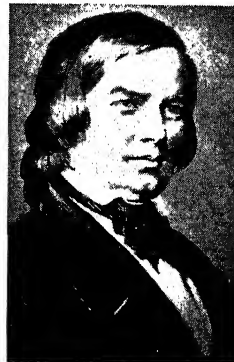
Schubert left more than 1,200 compositions, including more than 600 songs and nine symphonies. G.B.

**His Works** include the songs "Who is Sylvia?" "Ave Maria," "The Trout," and "Great is Jehovah"; song cycles such as *Winter Journey*, a group of twenty-four songs; the orchestral music "Marche Militaire" and "Rosamunde"; impromptus and sonatas for piano; six *Moments Musicaux*; and trios, quartets, quintets, chamber music, Masses, choruses, operas, and an oratorio.

**SCHUMANN, SHOO mahn, ROBERT** (1810-1856), was a German composer and pianist. Critics rank him with Franz Schubert as a composer of songs, and with Frédéric Chopin and Franz Liszt as a master of piano tech-

nique, both in writing for and playing the piano. Schumann was born at Zwickau, in Saxony. When he was eleven years old, he set the 150th Psalm to music. His mother was anxious for him to be a lawyer, and at the age of eighteen Schumann entered the University of Leipzig as a law student. But he soon decided to devote himself to music, and became a piano pupil of Friedrich Wieck. In 1840, Schumann married his teacher's daughter, Clara Wieck (1819-1896). Later she became well known as a concert pianist. She introduced many of Schumann's works to the public.

By the time Schumann was twenty-one, he had composed several piano pieces, including the much-loved "Papillons" (Butterflies). Then he started to write music criticism. In 1833 he became editor of the *New Music Journal*. Through this journal, Schumann was the first person to direct public attention to the genius of Chopin. Later, in 1853, Schumann published in his paper an article introducing the music of Johannes Brahms. He also gave support to such rising musicians as Felix Mendelssohn and Hector Berlioz.



Robert Schumann composed some of the best-loved of German songs.

In 1833, Schumann had a nervous breakdown and tried to kill himself. But within a short time he recovered his mental balance. The following year he wrote his first masterpiece, "Études Symphoniques," a set of twelve variations for piano. In 1835 he wrote his "Fantasy in C Major," which he dedicated to Franz Liszt. The year 1840, when he was married, is known as his "Song Year." During that year he wrote "The Two Grenadiers" and more than a hundred other songs, or *lieder*.

Beginning in 1843, Schumann taught for a while at the newly formed Leipzig Conservatory. In 1850 the young composer's health again broke down. Four years later, still suffering, he

threw himself into the Rhine River, but was rescued. He died in a hospital for the mentally ill. Schumann's wife edited his complete works, which total thirty-four volumes. G.B.

**His Works** include four symphonies; concertos for piano, violin, and violoncello; incidental music to Lord Byron's *Manfred*; chamber music; choral works such as "Paradise and the Peri"; and piano suites, such as *Scenes from Childhood*, which contains the popular "Träumerei."

**SCHUMANN-HEINK, SHOO mahn-HYNGK, ERNESTINE** (1861-1936), was a famous contralto. She was born at Lieben, near Praha, Bohemia (now Czechoslovakia). At the age of fifteen she made her debut as contralto soloist at Graz singing in Beethoven's *Ninth Symphony*. When she was seventeen she made her first operatic appearance at Dresden, in *Il Trovatore*. From 1896 to 1906 she sang frequently at the Wagnerian festivals at Bayreuth.



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**Madame Schumann-Heink** was one of the most-beloved singers of all time.

In 1898 Madame Schumann-Heink gave her first American performance in Chicago, in *Lohengrin*. Shortly afterward, she joined the Metropolitan Opera Company. She became an American citizen in 1908. During her later years she was popular in vaudeville and radio as a singer of simple German songs, or *lieder*. In 1904 and 1905 she toured America in a specially written comic opera, *Love's Lottery*, and in 1935 Madame Schumann-

Heink appeared in motion pictures.

During World War I some of Madame Schumann-Heink's sons served in the American army, while others served in the German army and one in the German navy. But she was loyal to her adopted country and sang in camps throughout the United States. F.B.

**SCHURMAN, SHOOR man, JACOB GOULD** (1854-1942), was an American educator and diplomat. He was born at Freetown, Prince Edward Island, Canada, and was educated at the universities of Edinburgh, Heidelberg, and Berlin. After some experience in teaching, he left Canada in 1886 and became professor of philosophy at Cornell University. In 1892 he was named president of Cornell. During 1912 and 1913 he served as United States Minister to Greece and Montenegro. In 1921 he was appointed Ambassador to China, and afterward served for five years as Ambassador to Germany. E.W.K.N.

**SCHURZ, shoorts, CARL** (1829-1906), was a soldier, statesman, and editor. President Charles Eliot of Harvard University called him the greatest American citizen of German birth.

Schurz was born at Liblar, Prussia, and was educated at the University of Bonn. As a student, he published a liberal newspaper and fought in the revolution of 1848. Schurz escaped to Switzerland after the revolution failed, and finally made his way to the United States.

He settled in Wisconsin and soon became a leading citizen. Schurz was active in the antislavery fight and

helped found the Republican party. President Abraham Lincoln named him Minister to Spain, but Schurz resigned this position in 1862, after the War between the States broke out, and joined the Union army as a brigadier general.

After the war he established a German paper, the *Westliche Post*, in St. Louis, Mo. It soon became a powerful influence in the West. In 1869 Schurz was elected United States Senator from Missouri and soon became the leader of the Republicans who were opposed to President Ulysses S. Grant. In 1872 Schurz helped to organize the Liberal Republican party.

President Rutherford B. Hayes appointed him Secretary of the Interior in 1877, and Schurz served until 1881. Schurz then retired from politics and became editor in chief of the *New York Evening Post*. From 1892 to 1898 he was chief editorial writer for *Harper's Weekly* and wrote in favor of reform measures. W.B.H.

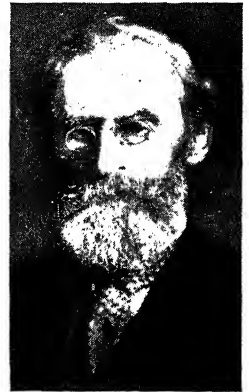
**SCHUSCHNIGG, SHOOSH nik, KURT VON** (1897- ), was Chancellor of Austria until Adolf Hitler forced Austria to unite with Germany in 1938. He was born at Riva in the South Tyrol, the son of an army officer. He made a brilliant record as a student at the Jesuit college of Stella Matutina. During World War I he served in the Austrian army.

Schuschnigg entered the Austrian parliament in 1927, and quickly rose to prominence. From 1932 to 1934 he was Minister of Justice, and during 1933 and 1934 he was also Minister of Education. Schuschnigg played a leading part in defeating the Socialists in the Vienna rebellion of 1934, and seized power as Chancellor after Engelbert Dollfuss was assassinated.

Schuschnigg was a strong German nationalist, but opposed union with Nazi Germany. He hoped that the pact he made with Hitler in 1936 would defeat Nazi plans to annex Austria. He called his government an "authoritatively Democratic Catholic German State," and was opposed by the Socialists as well as the Nazis. Schuschnigg wanted to keep Austria free and in 1938 he openly defied Hitler by calling for a plebiscite on the question of Austria's independence. But the plebiscite was never held. The Germans threatened to invade Austria if Schuschnigg did not resign. He reluctantly gave in, but the Germans marched into Austria anyway. Schuschnigg was held a prisoner until Allied troops freed him in 1945. He kept clear of politics and went to Italy, where he wrote a book on his experience as a prisoner of the Nazis. F.S.M.

**SCHUYLER, SKI ler, PHILIP JOHN** (1733-1804), was an American soldier and statesman. He is remembered for the part he played in the surrender of General John Burgoyne at Saratoga during the Revolutionary War.

Schuyler was born in Albany, N.Y. As a young man



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**Carl Schurz** championed the cause of freedom in Germany and America.

he fought in the French and Indian Wars. He was a delegate to the Continental Congress in 1775.



Chicago Historical Society  
**Philip Schuyler** led colonial troops in the American Revolutionary War.

After the Battle of Bunker Hill he was appointed a major general in the Continental Army and was given command of the Northern Department, which included New York. In 1777 Burgoyne and his army were advancing south from Canada to join with the armies of General Barry St. Leger. But Schuyler sent troops against St. Leger and wrecked this plan. In the meantime Congress ap-

pointed General Horatio Gates to Schuyler's place, and when Burgoyne surrendered Gates was given the credit. After the war Schuyler took part in Federalist politics. From 1789 to 1791 and 1797 to 1798, he was United States Senator from New York.

N.G.G.

**SCHUYLKILL**, *SKOOL kil*, **RIVER** is an important river in Pennsylvania. It rises in Schuylkill County and flows southeastward for about 100 miles. The river empties into the Delaware River at Philadelphia. The Schuylkill furnishes power, and part of Philadelphia's water supply. Coal barges sail on the Schuylkill River, which has been improved by dams and locks.

L.D., JR.

**SCHWAB, CHARLES M.** (1862-1939) made a great fortune in the steel industry.

He was born in Williamsburg, Pa., and became a stake driver in the Edgar Thompson Steel Works. Schwab worked his way up to the position of general superintendent of the Homestead Steel Works. When the nation's biggest steel companies joined to form the United States Steel Corporation, Schwab was elected the first president. Later he resigned to become president of the Bethlehem Steel Corporation. See also BETHLEHEM STEEL COMPANY. H.U.F.



Brown Bros.

**Charles Schwab** helped to develop the steel industry.

**SCHWANN, shvahn**, **THEODOR** (1810-1882). See BIOLOGY (History).

**SCHWARZ, BERTHOLD**. See GUN; GUNPOWDER.

**SCHWARZWALD, shvahrts vahlt**. See BLACK FOREST.

**SCHWATKA, SHWAHT kah**, **FREDERICK** (1849-1892), was an American Arctic explorer. He led the last expedition in search of the remains of the Sir John Franklin expedition. His party discovered graves and skeletons of members of the Franklin party but found no records. Later, Schwatka headed explorations in Alaska and Mexico. He was born in Galena, Ill., and was graduated from the United States Military Academy. See also FRANKLIN, JOHN, SIR.

J.Cot.

**SCHWEITZER, ALBERT** (1875- ), is a brilliant

German philosopher, physician, musician, clergyman, missionary, and writer on theology. His accomplishments in any one of these fields could be regarded as a full life's work for one man. Schweitzer has been called one of the greatest Christians of his time. Early in his career, he based his philosophy on what he called "reverence for life," and on a deep feeling of obligation to serve his fellowman through thought and action.

Schweitzer was born at Kayserberg, Alsace, and was educated in both France and Germany. At the age of twenty-one he decided to give his next nine years to science, music, and preaching, and thereafter to the direct service of humanity. Before he was thirty, he had won an international reputation as a writer on theology, as an organist and authority on organ building, and as an interpreter of Johann Sebastian Bach.

In 1902 he became principal of St. Thomas Theological College at the University of Strasbourg. In 1913, after seven years of studying medicine, he began his life of service as a missionary doctor to the natives of French Equatorial Africa.

In 1923 Schweitzer completed the first two volumes of his monumental work *The Philosophy of Civilization*. These are entitled *The Decay and Restoration of Civilization and Civilization and Ethics*. His other works include *The Quest of the Historical Jesus*; *My Life and Thought*; and *From My African Notebook*.

**SCHWENKFELDER, shvengk FEL der**, is the name of one of the early groups of people who came to America for religious freedom. In 1734, thirty-four families left Silesia, Germany, to settle in America. Others followed two years later, and a settlement was organized in Montgomery and Berks counties in Pennsylvania. The colonists founded an independent denomination in 1782. They took their name in honor of Kaspar Schwenkfeld (1489-1561), a German religious reformer. The church services are simple. The Schwenkfelders have a membership of about 2,200, and have six churches. See also CONSCIENTIOUS OBJECTOR. W.C.Kr.

**SCHWYZ, shweets**. See SWITZERLAND (History).

**SCIATICA**, sy AT ih kah, is a disease usually of middle-aged people. It consists of an inflammation, or swelling, of the *sciatic nerve*. The sciatic nerve passes from the lower part of the spinal column down the back of both thighs and legs. It is the longest nerve in the body. When this nerve becomes inflamed, it causes severe pain in the back of the thighs and legs. In extreme cases it may cause the muscles of the calf to waste away.

Sciatica is sometimes confused with other diseases, such as rheumatism.

Sciatica may sometimes be caused by the type of work done by the patient, or the climate. It may also be due to a lack of vitamins, such as thiamine or to exercise which is too strenuous. Sciatica is treated by giving the patient plenty of rest and keeping any pressure away from the swollen parts of the body. Heat is sometimes used in relieving pain.

P.R.C.

**SCIENCE, AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF**. See AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

**SCIENCE, ELEMENTARY**. See ELEMENTARY SCIENCE.

**SCIENCE AND INDUSTRY, MUSEUM OF**. See ROSENWALD, JULIUS.



Bridgeport Brass Co.; Westinghouse

**SCIENCE AND THE SCIENCES.** Every man and woman, even every boy and girl, can be a scientist. This is so because science is based on *common sense*. Thomas Henry Huxley, who explained Darwin's theory so simply, called it "nothing but trained and organized common sense." The Boy Scout uses science till he grows into a mechanic, a businessman, or a lawyer. In almost all professional fields, a person plans and does his particular work according to general rules which connect facts.

Facts and principles or rules which are used to explain or hold together what you know, and to help you discover what you still do not know, make up the heart of science. And these rules you find already at work to some extent in the case of the cave man, the savage of the jungle and the plain, the workman of ancient times, and the average citizen of today.

Every human being who has learned not to burn his hand in the fire or not to be deceived by the bent appearance of a straight stick partly under water is already a budding scientist. All he needs is a lot of training in facts and in explanations, and to know how to get at facts and explanations, or scientific method.

Nowadays, we do not call a person a scientist unless he has accumulated a great deal of specialized knowledge and a great deal of skill in using it or even in discovering it. It takes years of hard work to catch up with what people have done and learned through many thousands of years. In fact we could never learn all that if it were not for the fortunate fact that our knowledge has been pretty well organized. Scientific knowledge has been arranged, classified, made up into neat tables or schemes, put in general language, and built up like structures on the basis of understandable models.

#### Arranging the Sciences

The various kinds of knowledge have been tied up into parcels. This putting in order might be called the *classification of the sciences*. There are many individual sciences, like mathematics and chemistry, or *fields of science*, such as medicine, sociology, and even history. One might ask, "which belongs to which?" Many people have tried to arrange the sciences. A very great scholar of early modern times, the English philosopher, Francis Bacon, almost gave up and said "The divisions of the

sciences are not like different lines that meet in one angle, but rather like the branches of trees that join in one trunk." He included under science (from the Latin *scire* meaning *to know*) everything that sprang from the imagination, memory, and reason. Imagination produces the fine arts, such as poetry, music, and drawing. Memory produces history (natural and civil). Reason may be concerning God (theology), concerning nature (physics and metaphysics), and concerning man (psychology, logic, and ethics).

In modern times people speak of *pure sciences* like mathematics, physics, biology, and of *applied sciences* like mechanical engineering, radio, medicine, agriculture, as if they were quite different. They are not. They are rather like the two sides of the same coin. They are different only in the fact that they involve more or less a division of labor. The pure scientist lays down rules and says to the applied scientist, or engineer, "use them to build up something practical." But the engineer often finds the problems for the pure scientist to work on, and he also can lay down rules of his own which are pretty "pure." It is probably better for general purposes to arrange the sciences according to their particular interest or subject matter, that is, what they deal with. Such subject matter might be, for example, stars, chemical substances, numbers, fish, thoughts, or even ways of living. All sciences have something in common which make them science, and that is *scientific method*. Thus, it is convenient to make up a group of sciences which have as their subject matter things which you cannot touch, like numbers, thoughts, and call them *abstract sciences* (metaphysics, logic, mathematics). It is very convenient indeed to group together under the name of *natural sciences* all those which deal with things both living and dead outside of ourselves in nature, such as stones, stars, plants, animals (physics, chemistry, biology). Finally, we can study ourselves in a group of *human sciences*, the way we think and act alone and together (psychology and sociology).

We can also arrange the sciences in tables:

#### I. The Abstract Sciences

- A. Metaphysics—the science of all that is
- B. Logic—the science of thought and experience
- C. Mathematics—the science of quantity, size, and relationships

## DIVISIONS OF SCIENCE

## THE ABSTRACT SCIENCES

Metaphysics



Logic



Mathematics



## THE NATURAL SCIENCES

Physics



Chemistry



Biology



Physical Chemistry



Biophysics

Biochemistry



Geology

## THE HUMAN SCIENCES

Psychology



Sociology



Anthropology



Philology



## II. The Natural Sciences

- A. Physics—the science of matter and energy and their relations
- B. Chemistry—the science of the kinds of matter and their changes
- C. Biology—the science of living things and their histories

*Mixed Sciences*

Physical Chemistry—a link between chemistry and physics, that is, physical aspects of chemicals and chemical aspects of physical states

Biochemistry—the science of the chemical aspects of living processes

Biophysics—the science of the physical aspects of living processes

Geology—the science of the evolution of the earth from the physical, chemical, and biological aspects

## III. The Human Sciences

- A. Psychology—the science of individual experience
- B. Sociology—a group of sciences of group experience

*Mixed Sciences*

Anthropology—the science of the development of human types and arts

Philology—the science of human intellectual development, especially language

The sciences which deal with human society and the conditions in which it develops are sometimes called the *social sciences*. Anthropology, geography, economics, and government are a few of the fields of knowledge that are often called social sciences.

## Scientific Method

You often hear disputes in which someone says to his opponent, "Come, be scientific. Prove what you say scientifically!" What does such a person mean?

It all depends, of course, on what is being discussed. If it is just a fact like the sentence, "This is an oak," then the scientific thing to do is to make sure that you, the other fellow, or someone you trust has really observed it, seen it, perhaps touched it, and used previous knowledge about oaks to be quite sure that it is an oak. You are practicing *observation*, and you want it to be a correct observation. You can imagine someone else coming along, and saying without any coaching on your part, "This is an oak, all right." That someone else would be confirming the observation. Confirming an observation (or finding it wrong sometimes) is called *verification*. You yourself might want to verify your observation. So you *repeat* it and try to make sure in a somewhat different way. You may not trust your eyes and therefore try touching the tree, pushing it to see whether it was not just a painted tree, or you may start looking for acorns to make sure it is an oak and not another kind of tree. You might have to look up a definition or a description of an oak tree, match leaves, and cut off some of the wood.

Soon you would be experimenting or putting questions about your observation, to try it to see that it is not all a mistake or just something you imagined. If you are still as cautious as a true scientist usually is, you might want to take a picture of the thing in order to have a record so that no one could call you a liar about your findings.

You make records, which are technically called *protocols*. What you wind up with is a *scientific fact*, an ob-



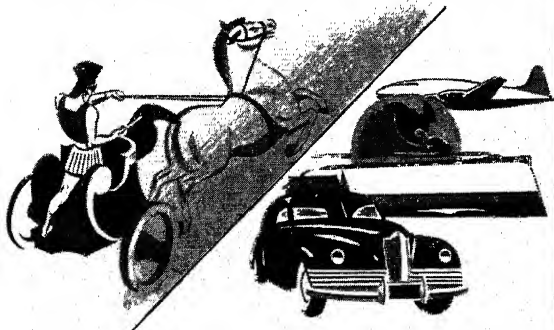


## HOW SCIENCE HAS CHANGED MAN'S LIFE

Man once had to work from dawn until dusk. Science has made life easier and has given man time for sports and arts.



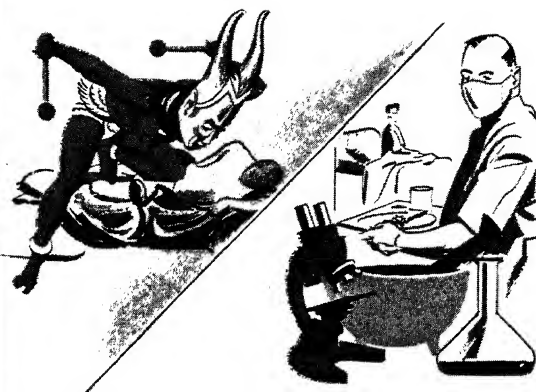
**Communication.** The drum and smoke signals of savages have been replaced by radio, telegraph, and telephone. Now messages can travel quickly to all parts of the world.



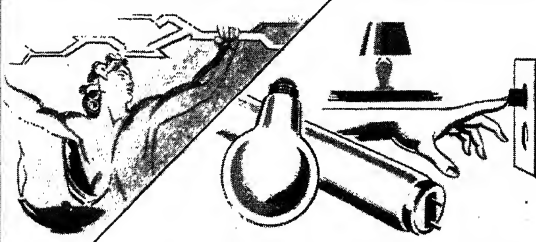
**Transportation.** The horse and sailing ship once limited the speed of man's travel. Today, automobiles and aircraft have made travel a matter of hours—instead of days.



**Industry.** Labor was once a matter of man-hours and human strength. Science has given man machines to lighten his tasks.



**Medicine.** Man's ills are no longer treated by witch doctors and voodoo men. Science has given modern medicine the means to cure effectively many heretofore fatal diseases.



**Light.** The Romans thought lightning was a weapon of the gods, and sputtering lamps lit their homes. Science has harnessed the lightning and given us convenient electric light.



**Clothing.** Primitive men relied on animal skins for their clothing. From the scientist's test tube have come methods of making cloth from substances like coal, milk, soybeans.



**Understanding Our World and the Universe.** Legend and superstition have given way to scientific facts about nature.

served and tested or verified fact, which can be repeated with the same observations by anyone else. You can bank on it as the *truth* and hope to make something bigger out of it. Knowing how to establish facts is a great art of science, and part of scientific method.

If you have not established a fact you will have a hearsay, gossip, or a bad observation (also called "mal-observation") like mistaking a pine tree for an oak. You might have to say, "Someone called this an oak, but I do not know that to be a fact."

Suppose, however, you are discussing a statement built up from a set of facts, like "Oak trees grow only in a warm climate." Your observations now have to be made on a big scale. You must look for oak trees in all climates—cold, warm, and hot. You must figure out exactly what you are going to call a warm climate. You must organize expeditions, or trust others to do so. You set up rules for making sure no one is lying to you. You must examine photographs. You get a mass of observations, or *data*. Even then you must *organize* the data, and arrange them in tables and see whether warm climate and the presence of oaks just fit together. Such a fit is called a *correlation*. If it all fits, that is, if oak trees constantly appear in warm climates and do not appear in cold and hot climates, you can then conclude that it is pretty safe to "generalize" that "oak trees grow only in a warm climate." This statement is called a *generalization*, and the reasoning whereby you think it is a pretty safe bet to say so is called *induction*. You do not *deduce* it from something general you already knew, like figuring out that Smith will die because Smith is a man and *all* men die, but you *induce* it. That is, you build it all up from observation of facts and noticing that they correlate or hang together. Science makes its findings by induction.

But can you be sure of the generalization—absolutely sure? There is always a chance that the generalization may break down. You might have to change the generalization to a more modest one like "oak trees usually grow only in a warm climate." The exception produces a new problem. Suppose you found an oak tree growing at the North Pole. You might figure it is a special kind and start many *experiments* or *tests* to find out some difference between the oaks in the temperate zones and the one at the North Pole. The chances are you will find a difference, let us say in the acorns. The North Pole acorn may refuse to grow in a temperate zone. A chemist might find that it has much more starch in it than the temperate acorn, and thus lead you to announce a new species. Thus many new discoveries come out of repeated testing of generalizations, to discover if they are not absolutely true.

Even the most general scientific laws (a law is a generalization of great scope), like Newton's law of gravitation which tells accurately how all bodies in the world attract one another, can be questioned and corrected. Scientists today believe that Einstein actually has a more "correct" law than Newton's. It covers more ground and connects up more things. We can always hope for greater and greater generalizations. That is the inspiration of science and its beauty. The usefulness follows as a matter of course, because you can harness nature only if you know what makes it tick.

### Some Big Jobs of Science

At the physical level, science follows nature around like a great detective. But its objective is not to find a criminal but to trace the history and evolution of every particle of matter from the tiniest atom to the greatest star. It does the same thing at the biological level, but confines its attention to things that live, and to their relations with the things around them, now called the *environment*. At both levels, prediction and control are of great importance to the scientist.

At the human level, however, an additional interest comes in. It is the desire to cure the ills of the world of man, and to cure them in a hurry, using everything we know of the physical, biological, and psychological to accomplish it. To make the matter simple, we can classify the exciting problems of science at the human level into three groups, namely, engineering, medicine, and sociology. We might also call them all "engineering" and label them as physical engineering, biological engineering, and human engineering. These sciences are often called *applied sciences* because they are devoted to solving practical problems.

One good example would be the attack on the problem of cancer. Research is organized, let us say, in an institute. What kind of people would be active there? Surely there would be at least a chemist on the job, a physicist, a pathologist, a physiologist, and a surgeon. In our opinion we would need a mathematician, a psychologist, and even an economist. We could use more than a dozen of other skills, too, merely to study the nature of cancer. The problem would hold them all together, *unify* them. We have called that *unified research*. What would those scientists do?

The mathematician would analyze the statistics on cancer and environmental conditions. His findings might show, for example, that sunshine is a factor in bringing about cancer of the skin. The physicist who knows a great deal about light, would make his observations which would help to explain such an effect. The chemist might find that the sunlight produces peroxides. The pathologist might explain the differences for various tissues in relation to light. The microscopist might find important clues. The physiologist might point out how the functioning of the rest of the body might protect or aggravate a condition. An immunologist might suggest methods of making protective serums. A biologist might come along and find an experimental animal for such experiments, for example, certain tropical fish. A botanist might point to cancers in plants which have interesting similarities and may even be curable. An anthropologist might furnish a clue by his knowledge of tribal habits, especially with regard to diets which might cut down the cancer rate.

If the problem is big enough and important enough, it can demand attention from all the sciences. Like all big jobs, the big jobs of science require unity around a problem.

### Science's Past, Present, and Future

The entire history of science can be looked upon as a story of achievement from small and crude accomplishments to the big jobs of today, like the construction of planes, radios, marvelous cities, healthy bodies, clean

minds, happy nations, and profound knowledge. The practical is a pretty good measure of the theoretical.

At first, man's little achievements must have appeared gigantic. They were fundamental. They dealt with the use of metals. Ages such as the iron age and the copper age have been named after early scientific discoveries and practices. The control of fire was a scientific task long before the modern match was invented. Agriculture was a science from the most primitive times and the farming of animals came even before that. The primitive savages had scientific knowledge of animals. The wheel was a primitive invention, but there has never been a cleverer one.

What we call "ancient" can be dated as far back as 6,000 years on the basis of some kind of written record (the most ancient hieroglyphics of Egypt). In such a record we learn of early boats and sails, an awareness of land measurement, and bits of arithmetic. As we come closer to our times—meaning the last thousand years—we find astronomy quite well-developed, the calendar good to an error of 1 per cent or 2, and some pretty bitter but not entirely ineffective medicine.

In the Middle Ages, especially in the 1200's to the 1500's, knowledge gained a surer footing. Great progress, for example, had to be made in navigation before Columbus could make his famous voyage of 1492. Science helped trade, and trade helped science. Ships were steered by observing the stars. It is small wonder that in the 1500's and 1600's astronomy and trade leaped forward. The recognition of the sun as the center of the system of planets made calculation easy. The geniuses Galileo, Kepler, and Newton revealed the law that moves all material bodies.

A great increase of new materials also forced more careful observation. Weighing and analysis led to modern chemistry. In the 1800's we learned not only how to take materials apart, but also how to put them together again (*synthesis*). Alchemy, which was largely synthesis at random, became chemistry.

Our own 1900's moved all the sciences forward at a rapid rate and generated many new ones. These were mostly specialties, cross-breeds, like biophysics, and unheard-of-sciences following basic inventions, like radio and aviation.

The rapid pace of the 1900's has opened up more opportunities in science than in other fields of knowledge. Each major invention calls up entire sciences, and there are literally hundreds of them—plastics, supersonics, thermionics, electronics, aviation medicine, antibiotics (penicillin, sulfa drugs), development of new plants and animals, control of insanity, world planning. There seems to be no end to problems arising from successes.

We can see huge programs for greater and greater control of power, new forms of matter, safety from hunger and diseases, and improvement of human behavior and ideals—all gained by the methods and results of science. Considering the greatness of the service the scientist can render to mankind, he should be the most honored and happiest of men. He should be supported on a scale at least as good as that of the soldier in war. His training is many times more rigorous and his toil quite as exhausting. He is not waiting for you or me to help him, however. He helps himself. He

teaches in our universities, carries on research there, in industry, and in government laboratories. He has founded numerous scientific societies and protective associations which also try to create scientific opportunities. The American Chemical Society alone has 30,000 members in the United States. There must be at least ten times that many scientific men if we count all the sciences. There must be one hundred times that many people in some way associated with scientific work. This is also more or less true of Europe. W.M.MAL.

### Science and Civilization

Are we civilized? We no longer live like ignorant savages in caves or mud huts, and we do not feast on dog meat or on the flesh of our enemies. We are even quite sure that we live much better than our ancestors did a thousand years ago or even a hundred years ago. We all like to think of ourselves as being highly civilized in spite of the fact that we have such things as gangsters and murders and wars. But just how civilized are we? And how has science helped us get where we are?

It is easy to see many ways in which we are better off today than our early ancestors. Man has put the wind, the waterfall, and electricity to work for him. He has domesticated animals and has grown new kinds of plants and has made plants and animals do as he wanted them to. He has learned to conquer many diseases. He has conquered the air with the airplane. He has found rich treasures of gold, silver, copper, oil, and iron in the earth.

But, more important than all this material wealth, science has shortened man's working day so that he has the leisure time in which to study himself and his world. Science has provided new tools for man to use in his studies. Moreover it has given him time and opportunity to produce things of beauty such as music, painting, and literature. Thus directly and indirectly science has made man's life richer. It has been one of the greatest factors in helping man become more civilized.

For many thousands of years before the beginning of written history man struggled to lift himself above the level of animals. He was not so strong as some animals but he had more brain power. He learned how to make things with his hands. He alone of all the forms of life on earth was able, by thinking and working, to gain control over the forces of nature.

In the Stone Age which ended about 5,000 years ago, man could make only rude tools out of stone such as hammers and arrowheads. Then he discovered soft metals like copper and gold which could be pounded into cups and pans and ornaments and various other shapes while they were cold.

About a thousand years before Christ, man discovered iron. This was a wonderful new hard metal which could be obtained only by heating certain kinds of rocks which we now call iron ore. This new metal could be shaped only while it was almost red hot. But iron has wonderful qualities. New weapons and tools could be made from it. Knives with sharp edges could be made so that they would keep their sharpness for a long time. We still live in the age of iron and steel, but we make far more than knives and hammers. We make automobiles, locomotives, skyscrapers, and suspension bridges.

### How Science Affects Man's Daily Life

It is hard for us to imagine what life would be without radios, telephones, airplanes, and many other things that science has given us. Young Abraham Lincoln studied his lessons by the dim light of burning logs in the fireplace. We turn blazing electric lights off and on without even thinking about it. General Ulysses S. Grant rode part of his way to West Point on a slow canal boat, but we dash about at high speeds in powerful automobiles.

But science means much more than just automobiles and electric lights. Without science our stores would have few of the things they now have to sell. A few hundred years ago people could hardly raise enough food or make enough clothing for their needs. Today in the United States alone, with the aid of science, huge factories and mills produce millions of tons of steel every month and weave millions of pounds of cotton, woolen, nylon, and rayon cloth a week. And by scientific farming great amounts of food are produced.

Science also has made it possible for people to live longer. A few men can produce so much with the help of machines and engines and motors and other scientific devices that man now has much more time for recreation and study and health. He has used part of this time to learn how to cure many diseases, and how to keep his body healthy by means of good food, fresh air, exercise, and proper care. These discoveries mean more days to work, more hours to play, and more years to live. A few hundred years ago so many young people died of disease that the average length of life was little more than thirty years. But today the average boy of 15 may expect to live to be 67, and the average girl of 15 may expect to live to be 71, if they take proper care of themselves.

Science and machines have freed man from much common work and drudgery which formerly was done right in the home. The early Puritans in New England had to make their own clothes and shoes, raise all their own food, and build their own cabins. They were busy from early dawn till late at night doing these chores. They had little time for recreation or improving their minds. How different things have become in the few hundred years since that time!

The home is no longer a workshop where at night, after the outside chores are done, father patches the wornout soles of the shoes while mother spins the wool from which to weave homespun cloth. Today there is leisure to listen to the radio, read books, play games, go to the movies, or study. But whether people are better off in the long run depends not on how much leisure they have but on how they use it.

Just as the father's burden has been lightened so also has the mother's. Mothers no longer have to be drudges bending over their washtubs most of the day and never getting far from the old-fashioned cookstove. There is now time to make the home a place of beauty and comfort. With new ways of building houses and new materials becoming available the home is becoming one of the best examples of the effects of science on civilization. Scientific lighting and heating turn hardship into comfort and comfort into luxury. Foods and fresh vegetables may be kept over long periods of time by the

new quick-freeze refrigerators. Even the air in homes and factories may be purified, cooled or heated, properly moistened, and recirculated by means of air conditioning. Not content with remaking his home life, man has remade his farms and cities. Along great rivers like the Mississippi he has built flood prevention walls. Other dams such as the great Boulder Dam have been built in order to water desert lands and turn them into fertile fields. While thus making new farms man must save the old. The steps taken to prevent wearing away (erosion) of our best farm land so we can save the fertile top soil on which the nation depends for its food supply are of utmost importance.

However, science brings new dangers to man along with its many blessings. Many of man's discoveries can be used to harm him as well as to help him. The airplane can be used to drop bombs and destroy cities as well as it can be used to carry food and medical aid to sufferers. The movies can bring us a wide education on many topics from travel in foreign countries to science. They can bring us pleasure and show us the meaning of life through comedy and drama. They also may be used to spread harmful ideas as was done in Nazi Germany or they merely bring us cheap entertainment which does more harm than good.

Science has brought new dangers but it also has brought new methods of combating danger. Policemen no longer use just clubs and guns to maintain public safety. They also use microscopes, fingerprints, and many scientific methods in detecting crimes. Firemen no longer use buckets, but high-powered pumps and chemicals. War has become so scientific that the victor must have not only the best guns but also the best scientists. And when guns and scientists become equally good on both sides, perhaps nations will recognize that war is no answer to their problems.

Man must learn that he is living in a world of constant danger to nations and to people, which is just as real as the constant danger of attack from Indians which hung over the early settlers. The dangers of an age of science are different. They are the dangers of the misuse of new powers and the dangers of ignorance and the misuse of leisure.

In the days of George Washington, one man could not travel far in one day. He could not see or talk to many of his fellow men unless they had taken weeks to come from far and wide as they did for Washington's inauguration as first President of our country. But today modern transportation by automobile and airplane and modern communication by telephone and radio make it possible for anybody to talk to almost anybody else in the whole world. A person can breakfast in San Francisco and dine in New York City on the same day. A trip between these two cities a little more than a hundred years ago might have taken six months either by water or by land.

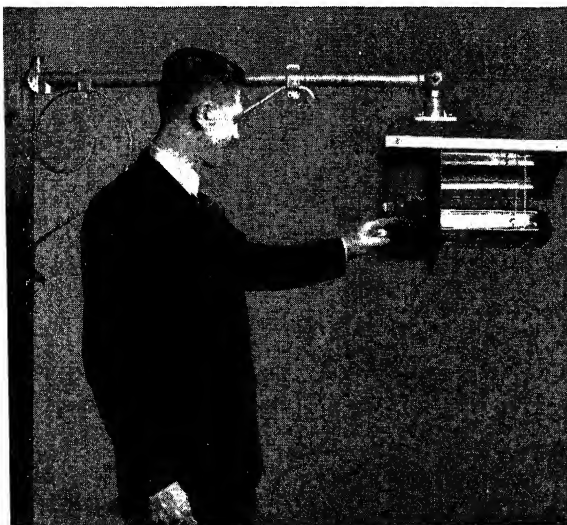
The effect of science is more far-reaching than this. The East and the West and the villages and cities are no longer separate and independent. No longer can people do as they please without affecting other people. Not even can nations do as they please any more without regard to the effect on other nations. Modern science has made everybody in the world a "cousin" to

## SCIENCE AIDS SAFETY

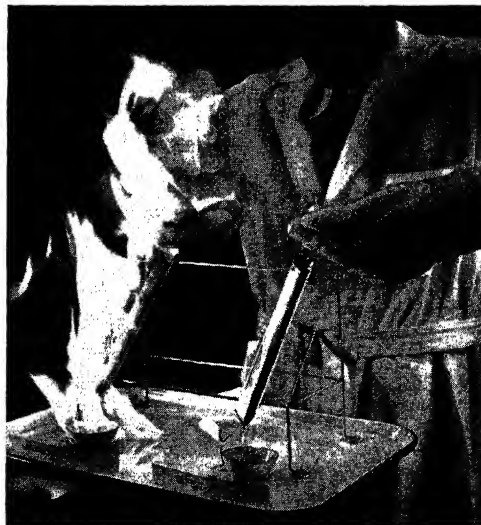


**A Scientist Tests a Girl's Field of Vision** to find out whether her sight permits her to drive an automobile. Scientific study of

vision, designs of traffic signs, and similar subjects, add to the safety of motoring.



**This Photoelectric Device** automatically turns on the sodium lights on a highway in the evening, or during dark periods of the day.



**A New Safety Gasoline** that does not catch fire easily reduces the danger in an auto crash.

Photos: General Electric; Automotive Club of Southern California; Standard Oil Co.



everybody else. The world must learn how to avoid such big family quarrels as world wars.

Science has so enlarged our spheres of activity that it has made us all world citizens. It has speeded up life so that what is said in a speech in Moscow or Tokyo is soon known by everybody in our country. It has speeded up education by new and more scientific methods as, for instance, visual education through movies in school, and in the home by radio and television. In all this tremendous development of science, our laws and our government must struggle to keep pace. Society is becoming far more complex, and more and more safeguards must be set up in order that people may live together for the best interests of all.

### Our Place in the Universe

While many of our own ancestors were still living the lives of rough barbarians in Western Europe, the Greeks were living like gentlemen and scholars. They were talking, studying, and writing about the great problems of life. Aristotle worked hard trying to classify all plants and animals. Archimedes discovered how to lift heavy objects with a lever, and declared that he could lift the earth itself if he could only find a place to stand.

The growing army of scientific thinkers went from one new discovery to another. Magnetism was discovered, musical scales were invented. Men also began to ask questions about the whole universe. The first great victory of science was won when men began to doubt the existence of spirits and demons and began to realize that everything happens according to natural laws. Today no sensible person believes that spooks or spirits control our lives or cause things to happen. We do not believe in lucky numbers or that our lives are controlled by the stars.

When we look up at the stars on a clear summer night we know that each little point of light in the sky is another planet or a far-distant star as large or larger than our own sun. When people looked up at the sky a few thousand years ago they did not see the same things at all. They thought of the sky as a kind of bowl turned upside down over the earth with little lights hung on it. Such a universe had to be a very small one. Early man could not imagine large distances. In fact, early people thought the sun was probably not so large as Greece. Today we know that the sun is a huge planet a million times larger than our earth. And we know that if we could ride on a sunbeam, which travels fast enough to go around the earth more than seven times in one second, it would still take us several years to get to the nearest stars and millions of years to get to the farthest ones visible in a telescope.

Ignorant or selfish people like to be in the center of things and like to think they are always right. In the early days men thought our world was pretty important, too. In fact, they thought it was the only thing of importance in the universe and that it was the exact center of the whole universe. This was the result of ignorance. Then four hundred years ago the great astronomer Copernicus showed that the world is not at the center of the universe at all, but that the earth and other planets rotate around the sun. Today we know that our solar

system (the sun and its planets) is only the tiniest part of our great system of stars most of which we see in the Milky Way. We know that we are nowhere near the center of this system. Besides this we know that far away there are many other such systems of almost countless stars and that these extend on and on as far as the telescope can reach.

In such a big universe man can scarcely think of himself any more as being the center of everything. He can not help wondering if there are other worlds inhabited by living beings. He may wonder what he himself really is and what his relation to the universe is. One reason why man studies science is so that he can better know the universe in which he lives, in hopes that he may thus better know himself.

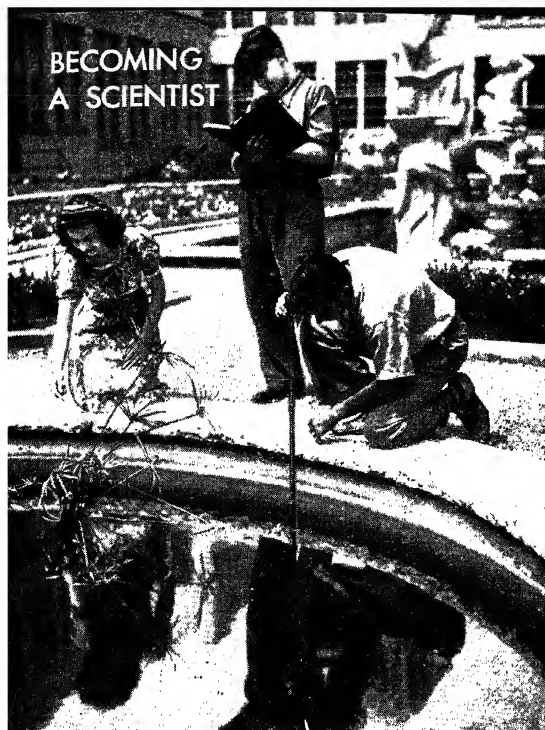
### Controlling the Forces and Materials of Nature

Man has worked hard to get where he now is. For long ages he had few sources of power except his own hands and his friend, the horse. Except for slavery where human beings were bought and sold to do work for their owners, man had to do his own work or else think up some clever way of getting it done for nothing. In The Netherlands the people learned to harness the wind and make windmills pump water and turn machines. In New England most of the towns were built near a river or waterfall where water wheels could be hitched to the looms that wove cloth, or to flour mills.

The horse was often hitched to a treadmill where he made the wheels go around and ground meal or pumped water. The use of the horse was so widespread that when the steam engine was invented men measured its ability to do work in terms of horsepower. The horse was one of man's best friends because it could do so much for him. One horse could do the work of nearly ten men. In addition, the horse could carry man with fairly high speed much greater distances than he could walk.

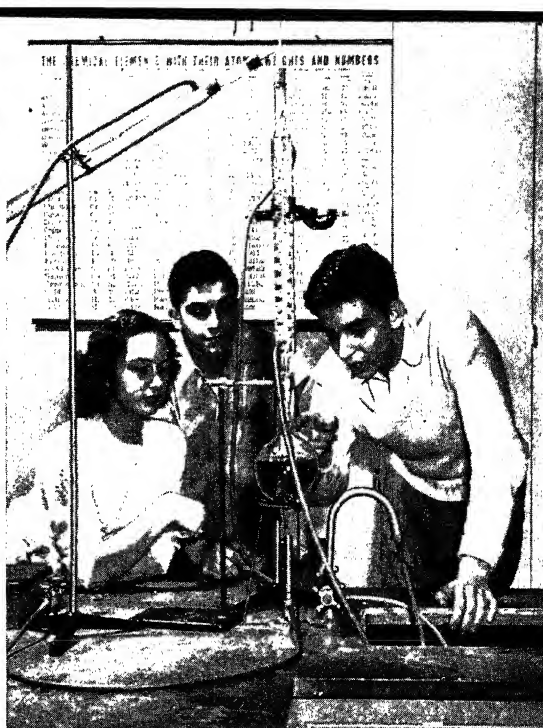
The invention of the steam engine by James Watt and others in England just before the American Revolution was a great new force. It changed the lives of millions of people and remade the cities of Western Europe into something entirely different. The effect of this force led to what is called the Industrial Revolution, which has affected the whole world. Cities had grown up as great centers of trade where people gathered to buy and sell silks and spices from foreign lands, rugs made by natives of Syria and Turkey, fruits from abroad, and cloth woven by hand in many homes in many lands. Now with the steam engine came the Industrial Revolution. Instead of dealing in wares the merchant gathered from many homes in many lands, men built big factories where things were made by machinery at high speed. Large numbers of things were made all exactly alike in a method called mass production. The coming of the machine age has provided us all with an unending supply of necessities and luxuries which are often better and cheaper than could be made by hand. At the same time it has brought a sameness of pattern and lack of individuality. And it brought much misery and low wages for those who worked in the factories.

But the steam engine also brought with it the locomotive, the railroad, and the first horseless carriages, the ancestors of our modern automobiles. After the



## BECOMING A SCIENTIST

**Youthful Scientists Leave the Classroom** to study the plant and animal life in a pool on the grade-school grounds.



**In High School and College,** students use more complicated and elaborate apparatus in their laboratory experiments.



**A Trained Scientist** directs graduate students as they prepare a weather-recording machine for a balloon flight.



**In a Malaria-ridden Jungle,** young graduate scientists set up their research apparatus to study control of malaria.

Photos: Chicago Board of Education; U.S. Marine Corps; Press Syndicate; U.S. Signal Corps

steam engine came the electric motor which produced still greater changes in cities. Then came the gasoline motor which runs our automobiles. Today by the use of steam, gasoline, and electricity man travels far and wide on the ground and in the air. He operates huge mills and factories. By means of telegraph, telephone, and radio he talks to anyone he wants to at any time.

From this it might be thought that we live in an age of perfection, but this is not so. The great cities have become overcrowded with workers in factories and mills. Many people live in little flats high above the street and have little recreation except motion pictures. They buy too much of their food in tin cans and they are dependent on great trainloads of meats, vegetables, milk, and coal rolling into the city every day. These city dwellers have gained certain advantages, but they have lost others. They have lost the old independence with which men took care of their own needs instead of depending so completely on others. They have lost contact with the world of open fields and woods and shaded grassy lawns and flowers and vegetable gardens.

Because the larger cities have thus become sadly overgrown, a movement is now growing for people to move away from overcrowded cities out to the country, near enough to the city for business but far enough away to avoid its disadvantages. Life in the country is no longer a life of hardship. The country home can have electric lights, refrigerators, radios, in fact, practically everything that people once thought they could get only in cities. The ability to send electric power to all parts of the country has made it possible for many people to escape the evils of the factory-made city.

Besides controlling power, man has learned to make the most remarkable new materials and substitutes for old materials. If we had to live for a few weeks on only materials we could find in nature, such as fruits and berries for food, skins for clothing, and roots and herbs for medicines, we would think we were being terribly mistreated. Indeed, we might have difficulty in surviving. We have become accustomed to such a variety of materials that we forget how little people had in the past, and how for long ages man has been struggling to make new and useful materials.

Man dressed in the skins of wild animals before he learned to make cloth from wool, cotton, and silk. Today he makes artificial wool out of sour milk and artificial silk (rayon and nylon) out of wood. Even glass can be spun and woven into a silklike fabric. The science of chemistry has made many such miracles come true. Today chemists are turning out many-colored substances called plastics which can be pressed and molded into an extraordinary variety of shapes, and can be used for numerous articles from toothbrush handles to dishes and electric insulators. So many such things are being made of these substances that it is said that we are living also in the age of plastics.

Man still lives in the age of metals. From using metals sparingly and with difficulty, man now uses metals in great quantities, and almost as easily as he uses wood or paper. Metallurgists continually seek new alloys like stainless steel and the light but strong aluminum alloys used in airplanes. If we had no metals, we would have no electric light wires and no telephone wires. Not even

radios could be built or used. The age of electricity depends upon the use of metals.

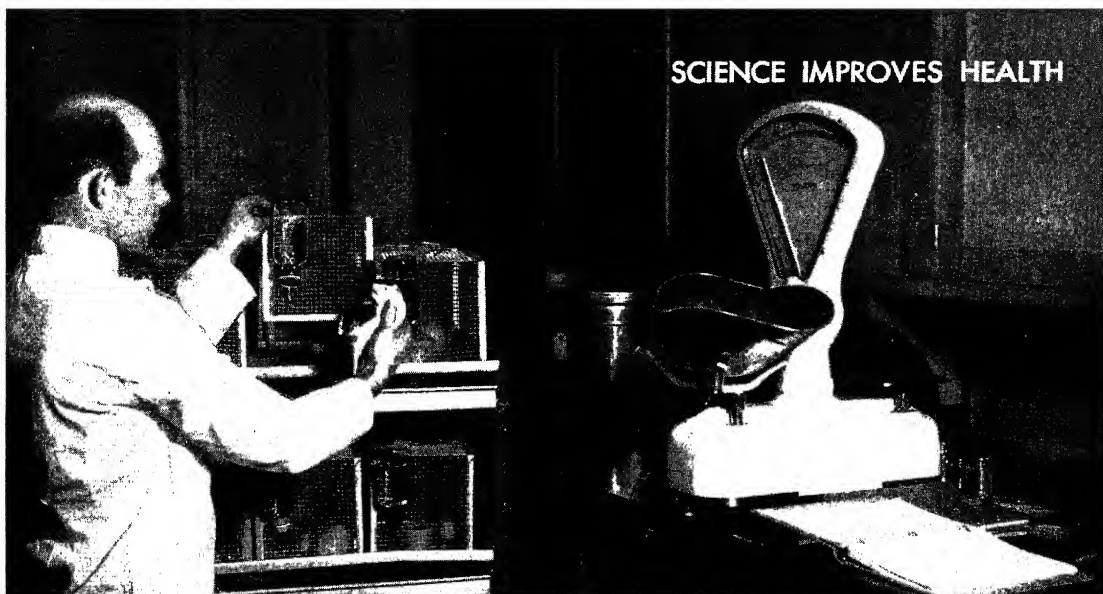
The effect on mankind of even a single new substance or discovery such as gunpowder or the atomic bomb may be tremendous. Gunpowder has affected the lives of entire nations and races as well as of individuals. But in spite of war after war the effect of gunpowder has by no means been all bad. It has helped protect the common people from the oppression of selfish kings. It helps the policeman keep our city streets safe and it helps the farmer keep wolves from his sheep. We must learn to use atomic energy even more for our own purposes, for it is far more dangerous than gunpowder.

In learning to control the forces of nature and in learning to make new materials out of old ones man has had to use more than just his eyes and ears and hands. It takes enormous machines to work iron and steel and to make electricity for our cities. It also takes the most delicate instruments imaginable to control other operations in the scientific laboratory. Science has helped man gain control over nature by first helping him to build measuring devices and other tools and instruments. Microscopes, telescopes, and thermometers are common types of such scientific tools. There are also others far more delicate that can measure distances too small to be seen in a microscope, and temperatures that would not show up at all on an ordinary thermometer.

The world is faced with two great problems. Science can make nearly everything necessary for life out of certain raw materials. Not all nations have a supply of these raw materials. Wars have been fought and may be fought again just to get these needed supplies. Nazi Germany fought to get control of new supplies. It could not have fought a great war if it had not already controlled a supply of coal and iron in the Ruhr Valley, and if it had not laid up huge piles of other materials, and without the great German chemical industry. In some way nations must learn to share raw materials so that no nation will have to go to war to win its share of needed substances.

Nations also must learn that the earth is our savings bank. There are just so many raw materials in the earth and no more. After they are spent there will be nothing left. Hence the world must learn to save for a rainy day and put off as long as possible the day when our resources are all gone. The earth today may seem to be so full of wealth that we need not worry. This is far from true. The combination of wars and reckless waste have brought us to the point where we can see all too plainly that our supplies of coal and oil are limited. It may be some time yet before the shortage of any one of these becomes dangerous, but the shortage is real even today. Science will help us find substitutes for old sources of energy but we must help ourselves by saving our supplies as long as possible.

In the meantime, as the population of the world increases, we also must take more care to preserve the priceless topsoil of our farm land and to use fertilizers which will enable us to feed more people from the same amount of land. Loss of farm land by flood waters, heavy rains, and heavy winds, as in the so-called dust-bowl in the Middle West, is just as serious as waste or loss of other resources. Man is still tied down to Mother



## SCIENCE IMPROVES HEALTH

The Study of Vitamins has had an important effect on health. This laboratory technician is examining an experimental

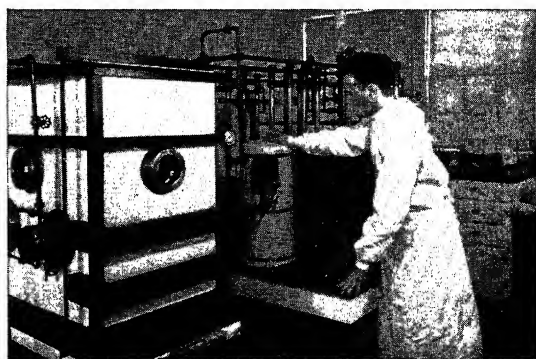
animal to determine the effect which vitamin A in its diet has had on its general welfare.



This Electronic Apparatus, shown with its inventor, cuts the time for production of penicillin from hours to minutes.



The Important Medicine, Quinine, can now be made in the laboratory, thanks to the work of these two young scientists.



Air-conditioning Equipment enables scientists to study germs in their search for the causes of many diseases.

Photos: Food and Drug Administration; R.C.A.; Polaroid Corp; University of Notre Dame

Earth. He has done wonders with the resources at his command but he has been frightfully wasteful.

### How Science Helps Control Life

Science has not only helped man to control the non-living forces of nature. It also has helped him control plant and animal life for his own benefit. One of the greatest achievements of early man was in taming and domesticating the horse, the cow, the pig, the sheep, and other animals. This was only the beginning. Long ago the Arabs learned to select only the finest horses for mating and only the finest offspring of these for further breeding. Throughout the ages the Arabs developed a breed of fine horses that became world-famous. This long experiment in breeding also has been carried on with cows and pigs and sheep and other animals. Now we have many fine breeds of animals suitable for different regions and different purposes.

In a similar way grains such as wheat and corn and fruits and vegetables have been selected year after year. These plants have been crossed or mated with other types having desirable qualities until wonderful results have been produced.

Besides careful breeding and crossbreeding to obtain new species, we have learned what foods are best for our domesticated animals and also for our plants. Like human beings, plants and animals also must have the right proportion of mineral and carbon compounds and they must have those foods which we call vitamins. All life comes from the heat of the sun. Without it all living things would die. The whole life-giving and growing process from sunbeam to Sunday dinner is a series of cycles in which energy is stored in one form to become food at a later stage. Cattle eat only grass and grain and plant life. Man, like many animals, eats the flesh of other animals though he usually is accustomed to cook it first.

The fight for man's survival is by no means completely won. Man no longer fears man-eating tigers but he still falls victim to the damage done by tiny forms of life—bacteria that cannot be seen by the naked eye. He must continually wage war against these unseen enemies. In the animal world the struggle to survive keeps up. It is the struggle between the forces tending to kill off a species and the forces tending to preserve it. This struggle can be very closely balanced. Sometimes man finds the balance of nature not to his liking and he tries to change it. There may be too many mosquitoes, as in the Panama Canal Zone where anopheles mosquitoes carried yellow fever. Man takes the side of making life harder for the mosquitoes by pouring oil on the stagnant waters where they grow. In DDT he has found a new weapon against his insect enemies.

Man must continually try to swing the balance in his favor by fighting his enemies. Sometimes in winning one victory he finds that he has upset the balance some other way. For instance, in 1872 the snake-killing Indian mongoose was introduced into the island of Jamaica to see if it would help kill the rats which threatened to ruin the sugar cane. The mongoose soon killed nearly all the rats. In time the mongoose itself became a pest. For want of other food mongooses killed the planters' chickens. It also killed a small lizard which fed on young mosquitoes.

This allowed the mosquitoes to increase. Thus winning one battle caused unfavorable results from another direction.

### Man Learns about Himself

Man has studied much and learned much about the non-living world of physical forces and about the worlds of animals and plants. But he also has learned a great deal about his own mind and body. He has learned how to cure himself of many diseases of mind and body. And, better still, he has learned how to prevent many of these ills.

The health of a nation depends on its individuals. Man has learned that he must keep fit by exercise, fresh air, healthful recreation, plenty of sleep, good food, and sane living in general. All of these things together spell hygiene. As we get further away from the healthful rugged outdoor life of the pioneer we must make up for it by observing the rules of hygiene.

Proof of man's increased physical fitness is seen in the way athletic records have been made better and better year after year. No longer do we tolerate public drinking cups and public towels where germs may breed and be passed from person to person. Science has helped to make our world more sanitary. It has helped us to obtain pure water by protection of water supplies and the use of filtration plants. It has given us government food inspection, sanitary handling of food, and the scientific disposal of garbage and sewage. It has helped control the sources of disease by proper quarantines and by use of germicides and by insisting upon the pasteurization of milk.

Increased physical fitness together with scientific control of the sources of disease helps to combat disease. In addition great progress has been made both in scientific medicine and in surgery. The sulfa drugs are now known to cure many serious infections. Penicillin is a powerful new weapon against many diseases. The tremendous reduction in such diseases as smallpox and tuberculosis is evidence of the success of scientific methods. And methods of inoculation have reduced risks of tetanus (lock-jaw) and typhoid fever almost to zero.

There are other diseases such as high blood pressure and heart trouble and cancer which are on the increase. These diseases are demanding the utmost scientific attention. These are diseases of older people rather than of younger people. Their increase is due in part to the high speed with which we do things and the many new demands and great strain of modern life. The increase of these diseases is due partly to the fact that more young people are living longer and are reaching the age when these diseases begin to come on.

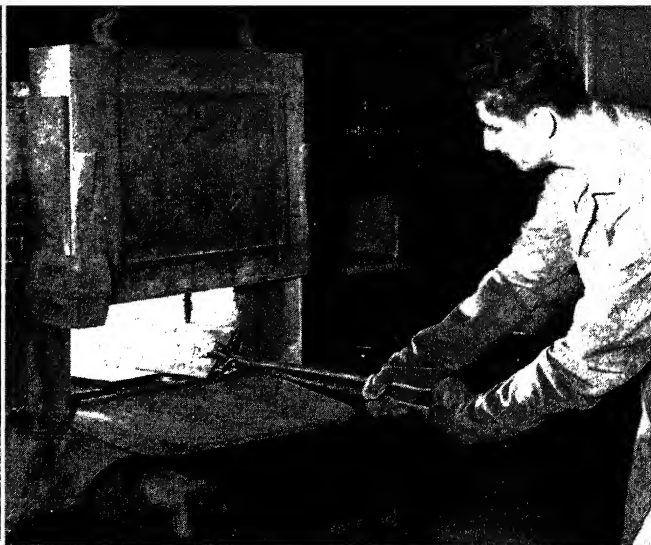
The death rate of infants and young children was frightful even a few generations ago. Today through scientific prevention and treatment the act of being born into this world is a relatively safe matter. Much of this is due to those physicians (*pediatricians*) who specialize in the care of the very young. Recently the problem of caring for the very old (*geriatrics*) is attracting more and more attention, and the problems of the aged are being studied.

The body is an engine which must be kept in good running order if it is to perform its duties. And it must be fueled by proper food and oxygen. Harvey discovered





**New Uses for Materials.** These articles are all made out of common straw.



Armour Research Foundation, Illinois Institute of Technology; U.S. Civil Service Commission  
**Science Develops New Materials.** The engineer is testing a slab of an experimental alloy in the tremendous heat of a furnace.

the circulation of the blood in 1616. Today we know that an athlete uses up glycogen in the blood and tissues which changes to lactic acid and produces fatigue. Every so often he must rest long enough for the oxygen he breathes to turn the lactic acid back into glycogen again.

But this human engine is a very complicated one. It is controlled by a system of nerves which carry signals back and forth from the central station (the brain and spinal cord) just as in a telephone system. The nervous system was traced to the brain by Haller about 1765. Today we know how fast a tiny electric impulse will travel along a nerve, and we know the kinds of electric currents given off by the brain and the heart. We also know that this nervous system must be kept in good condition if the body is to function properly.

There are also glands such as the thyroid and other glands which act like the balance wheel on a watch, or like the governor on a steam engine. They prevent one part of the body from getting out of control and slowing down or running away from the rest.

Most important of all is the brain. When something goes wrong with the brain the patient is sick indeed. Here is a great problem which science has only begun to tackle scientifically with the aid of the psychologist, the physiologist, and the physician. But one thing has been learned. This is that if mental disease is not due to an actually defective brain, it is a real sickness and can often be cured. No longer are insane patients put in cages and cruelly exhibited to sightseers as was done till 1777 in London's famous Bedlam.

Today the patient is studied by scientific methods to find what has caused his trouble. He is given proper physical and mental treatment by mental specialists. More than a third of the mentally ill so treated are improved sufficiently to be discharged. A good beginning has been made. Much more must be done before we really know how to keep people's brains working right. In addition society must face the similar serious problems of feeble-mindedness and alcoholism.

#### History of Science's Influence

Many things which are so common today we scarcely

think of them as scientific achievements were in reality among the greatest scientific achievements of the human race. One of these was the invention of a written language. Before the invention of writing there could be no history and no science except that which was passed along by word of mouth. Today we do not go by hearsay. We make use of all the knowledge gathered by the generations before us. At our finger tips in books and libraries we have the experience of past centuries. Without writing no great systematic fields of knowledge could have developed. But for ages writing was a slow, laborious process mostly done by people who had become trained scribes, devoting their lives to writing and copying.

When John Gutenberg invented movable type in 1450 and printing was made possible, a new age dawned. The knowledge hidden in dusty manuscripts could now be made available to everybody. The number of books available to everybody is now astonishing. Books were soon followed by newspapers and magazines. One might think that this was so great an achievement that nothing more could be desired or imagined. But not so! The radio, the moving pictures, and television, first used mostly for entertainment, are being used more and more to educate people and to make available to all the ever-accumulating knowledge of the present age.

Scientific investigation can not answer every question. It can not tell all about man, where he came from, or where he is going. It can not tell all about the universe. It is limited to those things we can see or to those things which we can not see but which we can make to give us a visible response of some kind. X rays we can not see, but we can make them produce a visible effect on a photographic plate or on a fluorescent screen. Scientific investigation is the only source of accurate trustworthy knowledge whose truth can be tested by experiment. Its results and methods must be reliable or they are immediately cast out and reliable ones are found. What we call scientific truth must not be thought of as always absolute and final. In many cases the information on which we base scientific conclusions is not complete. For this reason scientific knowledge is continually growing, and must often be revised.

In those fields where it is not yet possible to get exact scientific information, we may have strong beliefs. Frequently these beliefs are the results of something our ancestors believed. They may be the result of some natural desire within us. It is questionable how far such beliefs may be trusted. We no longer live to ourselves but must live with other humans in a complicated social order. The usefulness of such beliefs can be tested by whether or not they help make the world a better place to live in or a happier place.

In past history the human race has seemed to stand still for long periods of time before a revolutionary discovery. Then after a particular and perhaps revolutionary discovery, progress comes at a rapid pace. Some of the most revolutionary moments in the world's history are listed below in the order in which they occurred.

The discovery of fire  
 The invention of the wheel  
 The invention of writing  
 The beginning of scientific questioning (Thales and the Greeks)  
 The beginning of experimentation (Archimedes and the lever)  
 The age of Copernicus  
 The age of Galileo and Newton  
 The invention of the steam engine  
 The discovery of electromagnetism by Faraday and Oersted  
 The age of Einstein and the liberation of atomic energy.

Each discovery or invention has had its own marked effect in determining the future history of mankind. Caesar's bridge across the Rhine was the first fixed military bridge to be thrown across a stream on short notice. The invention of glass goes back at least to the ancient Egyptians. The invention of doorknobs and locks goes back to the Romans who had beautifully made kinds. There was the invention of the telescope and spectacles and clocks. More recently there was the invention of the weaving loom and the steamship and the automobile. How each of these has affected the development of civilization is a story in itself.

The invention of the steel plow and the binder and reaper made the farmer a big-business man. The old forked stick with which early man had tilled the soil was thrown away.

In Western Europe, during the Middle Ages, feudal lords gathered their vassals around them in groups for protection and to till the soil and tend their farm animals. But soon there came a need for shops and stores where people could trade or buy from other people. Thus the towns grew up. The more successful shopkeepers became merchants and the merchants from different towns formed groups for self-protection. The towns flourished and some of the merchants became bankers.

If it had not been for these merchant-bankers science would have developed more slowly. They wanted exact knowledge of many things such as how to navigate the seas. Commerce with other countries brought exchange of ideas. The news of scientific discoveries was carried far and wide. The universities began to show more of an interest in science. The Church began to fear that science might cause it to lose its power. The age of modern experimental science began in the 1600's with Galileo and Newton. The Church began to oppose science and im-

prisoned Galileo because he agreed with Copernicus that the earth was smaller than the sun and that it was not the center of all things.

The new spirit of science could not be crushed by the Church or by any other opposition. Science was to be the guiding influence in conquering the world and in civilizing mankind.

While the people of Western Europe used the steam engine and developed factories and scientific methods of producing food and clothing and other necessities, the peoples of the Orient kept their old customs. They followed the old methods of tilling the soil and making things by hand. They were content to worship much of the past instead of trying to build a new world. They still suffered famines and they were without many comforts. They had their own ideas of what was good and to them the new machine age was bad. It made people hurry too much. It made them lose their individuality and it gave them no time to worship the beautiful things of the past. Whatever was good in this viewpoint was bound to give way sometime before the all-powerful advance of Western civilization based on scientific progress. First Japan began to imitate the Western World. Finally with the second World War, China had to accept Western ideas or perish. Today the whole world is rapidly becoming a scientific world.

#### The Need of Science in Social Control

Man has made astonishing conquests and successes in the past few hundred years in learning how to control the forces of nature and in learning how to make his own life safe and comfortable. He has seized upon the great stores of wealth in the earth itself and has used them lavishly to give himself every luxury regardless of future generations. He has in remarkable ways adapted plant life and animal life to his own uses. He has fought harmful bacteria and almost vanquished many kinds. He has put other bacteria to work for him to produce foods and medicines. He has created many things of great beauty in music, art, sculpture, and architecture. But man also has made many miserable failures. He is painfully aware of most of these failures and they stand out as the future battles which he must fight and must win.

He has learned much about his own body and about his brain and how each works. He has learned how to feed and clothe himself. There are times in spite of all these powers and in spite of all these riches of the earth when some people do not have enough food or clothing or money. When a larger number of people lose their jobs and can not get sufficient food or clothing it is called "hard times" or an economic depression. When everybody has plenty it is called "good times." Such "hard times" are most likely to follow, sooner or later, after a war in which nations have spent most of their hard earned savings in fighting other nations.

But man's biggest failures have been undoubtedly in learning to live in groups. Nations are like big families. They must learn to live with their neighbor nations without quarreling and fighting and they must learn to so run their own affairs that everybody has an equal chance in life. The first of these is the problem of war. The world is painfully aware that this problem has not yet been

## SCIENCE AND THE SCIENCES

solved. Not only have wars become so big that they affect the whole world but they have become far more violent because of the discovery of new and more destructive forces and weapons. Nations have not yet learned to prevent selfish and evil people from gaining control of political power.

Neither have they learned how to prevent hard times and how to give everybody an equal chance. Science can tell exactly how high a balloon will go or how fast a stone will fall when dropped. But nobody has yet found how to tell exactly how high prices will go in good times or how far wages will drop in hard times. Science can make exact calculations about nonliving objects, but when it comes to living people the calculations are far more difficult to make and not many things can be calculated. When it comes to groups of living beings such as nations, the problem becomes still more difficult. Yet man must try to find ways of controlling nations and he must try more and more to learn the scientific rules by which he can do it.

Life insurance companies can tell very accurately how many people in ten thousand will live to be a hundred years old, but they can not tell how long any certain person will live. As civilization goes forward we must learn how to know more and more about people even if we can not predict exactly what any one person will do, and we must depend less and less on guesswork. All of these things are up to man himself. They are the final battles in the application of the scientific method, and man must try to win. If he does not, all the marvelous developments of science can be turned into weapons for his own destruction.

R.D.R.

**Related Subjects.** The reader is referred to the article on **ELEMENTARY SCIENCE**, to the lists of Scientists in the **BIOGRAPHY** section of the **READING AND STUDY GUIDE**, and to the following articles in various volumes of the **WORLD BOOK ENCYCLOPEDIA**.

### SCIENCES

Aerodynamics	Mathematics
Anthropology	Medicine
Archaeology	Metallurgy
Astronomy	Meteorology
Bacteriology	Paleontology
Biochemistry	Philology
Biology	Philosophy
Botany	Physics
Chemistry	Physiology
Ecology	Psychology
Engineering	Sociology
Geography	Zoology
Geology	

### UNCLASSIFIED

Arts and Sciences,	National Academy of Sciences
American Academy of	National Research Council
Experimentation,	Research
Scientific	Royal Society
Instrument, Scientific	Royal Society of Canada
Invention	Sigma Xi

### Questions

What do you understand by the saying "Science is organized common sense"?

Are "pure" science and "applied" science entirely different? Explain.

How would you go about arriving at a scientific conclusion about some natural fact?



FBI

**Science Aids Crime Detection.** This FBI technician is using a comparison microscope to identify a bullet used in a crime.

When and how does a scientist make a generalization?

How could all the sciences contribute to the solution of such a problem as the control of cancer?

What is the difference between *analysis* and *synthesis* in science? When did synthesis as a scientific method develop most rapidly?

How has science contributed to the development of the arts?

How has science made it possible for man to live longer?

In what ways may science bring dangers as well as advantages to man?

What are some of the substitute substances that man has developed through science?

Why are measuring devices extremely important to the scientist?

To date, what have probably been man's greatest failures in controlling his world?

Why is experiment important in science?

Can science predict the behavior of living or of non-living things more accurately?

How did the merchants help the development of science?

**SCIENCES, NATIONAL ACADEMY OF.** See **NATIONAL ACADEMY OF SCIENCES**.

**SCIENTIFIC ATTITUDE.** See **SCIENCE AND THE SCIENCES**.

**SCIENTIFIC EXPEDITION.** See **EXPLORATION AND DISCOVERY**; **PLANT EXPLORATION**; **POLAR EXPLORATION**.

**SCIENTIFIC INSTRUMENT.** See **INSTRUMENT, SCIENTIFIC**.

**SCIENTIFIC-RESEARCH ATTACHÉ.** See **ATTACHÉ**.

**SCIENTIST.** See the lists of Scientists in the **BIOGRAPHY** section of the **READING AND STUDY GUIDE**.

**SCILLY, *SIL lih*, ISLANDS** lie in the Atlantic Ocean off the coast of Cornwall, England, about twenty-five miles from Land's End. The islands are part of Britain.

They are the first bits of land which travelers see as they approach England from New York City.

There are about 150 small islands in the Scilly group, but only five of them are important. The capital of the island group is Hugh Town, which stands on Saint Mary's Island.

The islands cover an area of about  $5\frac{1}{2}$  square miles, and have a population of about 2,000. The Scilly Islands are wild and colorful. Great cliffs face the Atlantic Ocean. The climate is mild. The chief occupations are flower growing, fishing, and farming. W.E.E.

**SCIMITAR**, *SIM ih ter*. See **SWORD**.

**SCION**, *SI un*, a variant of **CION**. See **GRAFTING**.

**SCIOTO**, *sy O toh*, **RIVER**. This branch of the Ohio River drains the central part of the state of Ohio. It rises in the west central part of the state, flows eastward at first, and then turns south. The Scioto empties into the Ohio River at Portsmouth. Between 1832 and 1875 the Ohio and Erie Canal was the main water route of Ohio, and the Scioto River became an important commercial waterway. Its waters fed the Ohio and Erie Canal, which ran nearly in a line with the river from Columbus, the Ohio state capital, to Portsmouth. The Scioto River drains a rich, farming region. L.D., Jr.

**SCIPIO**, *SIP ih oh*, **AFRICANUS, MAJOR AND MINOR**, were two members of a branch of the great Roman family of the Corneli.

**Publius Cornelius Scipio** (237-183 B.C.) was called **AFRICANUS MAJOR**, or elder, because of his victories in Africa. He is considered the greatest Roman general before Julius Caesar. As consul, Scipio found a way to defeat the great Carthaginian leader Hannibal in the Second Punic War. He took Spain, from which Hannibal received supplies, away from the Carthaginians and later invaded Africa. This act caused Hannibal to leave Italy,

and in 202 B.C., he was defeated at Zama. The power of Carthage was completely destroyed and the war was over.

For more than ten years Scipio was the most powerful man in Roman public life, but many senators became jealous of his fame and criticized his policies. When his brother Lucius was convicted of dishonest practices, Scipio's pride was wounded and he retired from public life.

**Publius Cornelius Scipio Aemilianus I** (185-129 B.C.), was the grandson by adoption of the elder Scipio. He was called **AFRICANUS MINOR**, or younger, also because of his victories in Africa. During the famous siege of Carthage which ended the Third Punic War, Scipio was elected consul and was given command of the army in Africa. In 134 B.C. he was again elected consul and given the task of conquering the Numantines in Spain. Afterward he devoted himself entirely to political affairs and became one of the leaders of the aristocratic party. Scipio was a man of culture, and throughout his life was an admirer of Hellenism, or Greek culture. He was the head of a circle of intellectuals known as the *Scipionic Circle*. See also **HANNIBAL**; **PUNIC WARS**. W.S.F.

**SCISSORBILL**. See **SKIMMER**.

**SCISSORS**. A pair of scissors is really two knives with their blades joined together to form a double lever. Each blade of a scissors is a lever of the first class. The pin or bolt which holds the blades together is their common fulcrum. Squeezing the handles of opened scissors starts the blades in their lever operation. They apply pressure against both sides of the material to be cut until the blades are completely closed. See **LEVER**.

In common speech, scissors and shears are often taken to mean the same instrument. But in the hardware trade, the word *shears* is used for scissors with blades more than six inches long. The handles of scissors are usually rings of equal size. Those of shears are larger on one handle



Brown Bros.

**Scipio Africanus Major Returning the Spanish Princess** to her lover. The young man is on his knees pleading with Scipio while a slave pours gold coins on the ground. The Romans cap-

tured the princess when they took Spain from the Carthaginians in 206 B.C. The great Roman general is seated, listening to their pleas for the girl who stands beside him.

so as to have room for four fingers of the cutting hand, with the other ring for the thumb.

In size and use, scissors and shears range from tiny manicuring scissors to great power-operated metal shears used to cut scrap metal to size for steel mill furnaces.

*Pinking shears*, or *pinking scissors*, have wavy cutting edges. They are used in dressmaking to give cloth a scalloped edge.

**SCISSOR-TAILED FLYCATCHER.** See FLYCATCHER.

**SCLERA**, *SKLE rah*. See EYE (The Eyeball).

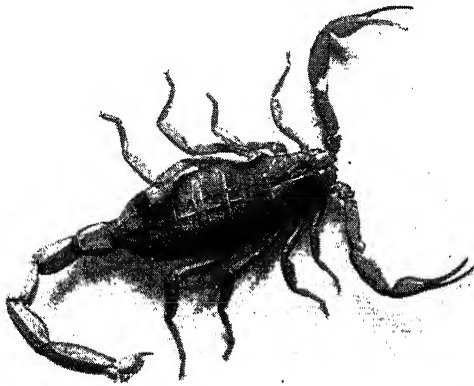
**SCLEROMETER**, *sklee RAHM e ter*. See HARDNESS.

**SCOOP.** See NEWSPAPER (Terms).

**SCOPAS**, *SKO pas*. See SCULPTURE (History [Greece]).

**SCORIA**, *SKO ri ah*. See NORTH DAKOTA (Natural Resources).

**SCORPION**, *SKAWR pih un*. The scorpion is a small animal with a dangerous poisonous sting in its tail. Most people fear the scorpion because of its sting and ugly appearance. The scorpion is not an insect. It belongs to a class of animals called *arachnids*. Spiders, mites, and ticks also belong to this class. Scorpions live in warm



Cornelia Clarke

**The Scorpion** is common in the southwestern part of the United States. It stings its prey and sucks the body juices.

countries in most parts of the world. There are about twenty different kinds in the United States. One of these lives as far north as Medicine Hat, Alberta, in Canada.

The body of the scorpion has two parts. The forward part is short and rather thick. This part is called the *cephalothorax*. It is made up of the head and chest (thorax), which are joined together. The hind part is the long abdomen. The last five segments of the abdomen form a slender tail. Scorpions are usually black or yellowish and grow from half an inch to eight inches long.

The front part of the scorpion has six pairs of leg parts. The front two pairs have claws, and the second pair looks like the claws of a lobster. The last four pairs are used as legs.

There are six to twelve eyes—different kinds of scorpions have different numbers. The breathing pores are on the abdomen.

All mother scorpions produce their young alive. The newly born young stay with the mother several days after they are born. They cling to her body with their tiny pincers.

Scorpions eat large insects and spiders, and are most active at night. The scorpion's sting is a curved organ in the end of its tail. Two glands at the base give out a poison that flows from two pores. A scorpion wound is very painful, but does not usually cause death. The poison should be sucked or squeezed out of the wound, and the spot should be bathed with ammonia. E.A.C.

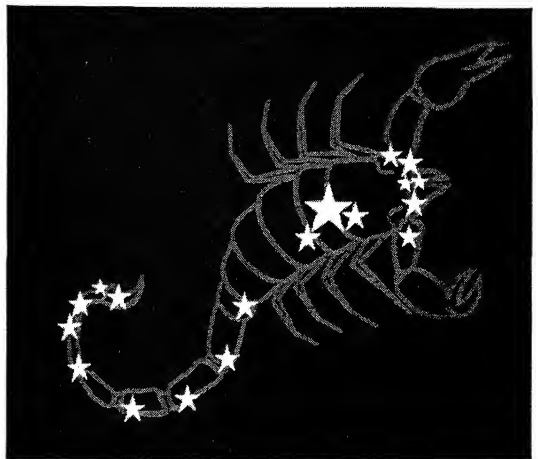
See also ARACHNID; ARTHROPOD.

**Classification.** Scorpions are arthropods of the class *Arachnida*. They make up the order *Scorpionida*. The scorpion that lives in Canada is *Vejovis boreus*.

**SCORPION FLY** is a small insect with long wings. The male has two slender, pincerlike growths on the end of its body. These growths look like the scorpion's stinger. It is not a true fly, for it has four wings instead of two. The scorpion fly is about a half inch or more in length, and its two pairs of wings are netted and as long as its body. The pincers can be used to clasp objects, but they are not a stinging organ. Both adults and larvae feed on dead or dying insects. The adults also eat some vegetable matter. They lay their eggs in cracks in the ground. The larvae, which resemble caterpillars, hatch in about a week and grow rapidly. However, not much is known about the life cycle. C.D.D.

**Classification.** Scorpion flies make up the family *Panorpidae* in the order *Mecoptera*. True flies are in the order *Diptera*.

**SCORPIUS**, or **THE SCORPION**, is the eighth sign of the zodiac. Its symbol is ♏. The constellation Scorpius appears in the southern part of the sky. It contains the bright star Antares, a giant star which shines with a fiery-red light, and is of the first magnitude of brightness. It has a companion star of seventh magnitude, whose light is greenish. According to Greek mythology, Orion boasted that he would kill every poisonous reptile on earth, and Diana sent the scorpion to sting and kill him. The scorpion also frightened the horses of the sun when Phaëthon, the son of Helios, tried to drive them. See also ANTARES; CONSTELLATION; ZODIAC. C.F.



**The Constellation Scorpius, or the Scorpion.** The great bright star Antares is located near the center.

**SCOTCH COLLIE.** See COLLIE.

**SCOTER**, *SKO ter*. See DUCK (Wild Ducks).





Gendreau; Acme

**SCOTLAND** takes up the rugged northern part of the island of Great Britain. The country was once an independent kingdom, but it has been part of the United Kingdom since 1707. The Scots gave Scotland its name. They were people who came from Ireland in the 500's and founded the first Scottish kingdom. The Romans called Scotland *Caledonia*. Some poets and writers still call Scotland by the old Roman name.

The products of Scotland are well-known. Powerful Clydesdale horses, small Shetland ponies, brave little Scottie dogs, and beautiful collies are all Scottish breeds. The first woolen plaids and tweeds came from Scotland. So did the game of golf, which people in many countries now play. Scotch shortbread and Scotch whisky are other well-known products of Scotland.

The Scots people cherish the symbols of their romantic history. The royal crown of Scotland is kept in the castle of the Scottish kings at Edinburgh. Over this castle flies the old royal flag, which is a red lion on a yellow ground. Many Scottish Highlanders still wear their knee-length pleated skirts or *kilts*. People with a Scottish name are proud of the *tartan* which represents their clan. Each Scottish clan, or family group, had a plaid woven in a design different from all other plaids.

#### The Land and Its Resources

**Extent:** Total area, 30,405 square miles; water area, 609 square miles. **Greatest length,** 274 miles; **greatest width,** 145 miles.

**Physical Features:** *Chief mountain regions,* Northwest Highlands, Grampian Hills, Cheviot Hills. *Chief peaks,* Ben Nevis, Ben Alder, Ben Avon, Ben Macdui, Ben More, Ben Cruachan. *Elevation,* highest, Ben Nevis, 4,405 feet above sea level; lowest, sea level, at coasts. *Chief rivers,* Clyde, Spey, Dee, Tay, Forth, and Tweed. *Chief lakes,* Lomond, Katrine, Shin, Linnhe, Ness. *Chief bays (firths),* Clyde, Lorne, Moray, Tay, Forth. *Chief islands,* Orkneys, Shetlands, Hebrides.

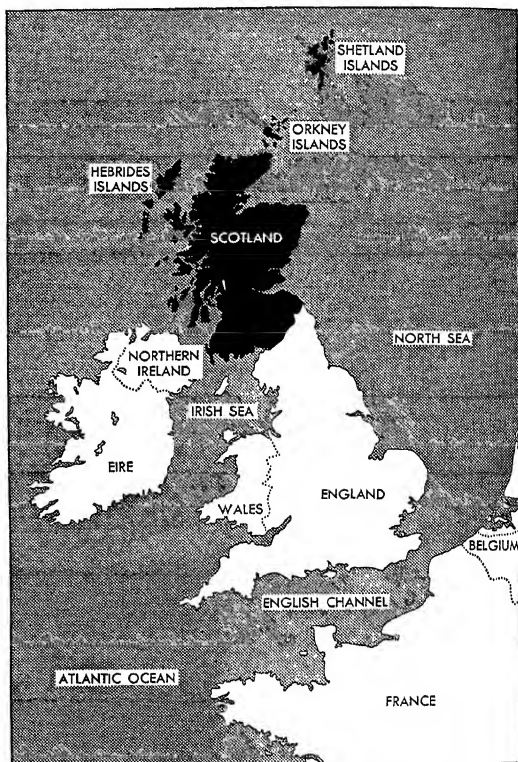
**Location, Size, and Surface Features.** Scotland lies between the North Atlantic Ocean and the North Sea. It is surrounded by water except in the south, where the Cheviot Hills mark the English border.

Scotland is about the size of the state of South Carolina. The country is widest in the region of the Grampian Hills, and narrows to a width of only 30 miles in the Lowlands. For the boundaries of Scotland, see GREAT BRITAIN (colored map).

**Natural Regions.** Scotland is divided naturally into three regions. These are the Highlands in the north, the Central Lowlands, and the Southern Uplands. The Highlands include the two mountainous regions called the Northwest Highlands and the Grampian Hills. The entire Highland region is marked by parallel, craggy ridges which run from northeast to southwest. Deep

narrow valleys, or *glens*, lie between the ridges. Rushing streams flow through some of the glens. Long mountain lakes called *lochs* lie deep in other glens.

The highest ridges are in the west, where short, rapid streams have cut deep valleys all the way to the rocky coast. In the east, broad rolling *moors*, or grassy plains, stretch down to the sea. Wide, low valleys called *straths*



Location Map of Scotland

lie between the ranges of hills. The deep valley of Glenmore separates the Northwest Highlands from the Grampian Hills. Loch Ness lies in this valley.

#### Pronunciation Guide

Ben Avon	ben AV ahn	Hebrides	HEB rih deez
Ben Cruachan	ben KROO kan	Jacobite	JACK oh bite
Ben Macdui		Loch	lahk
	ben mack DOO ee	Spey	spay.
Frae	fray		

The Grampian Hills rise below Glenmore. They are the highest mountains of Great Britain. The Grampian Hills have many peaks, including Ben Nevis, the highest point in Great Britain. The deep glens, craggy peaks, heather-covered moors, and beautiful lakes of the Grampians have been made famous by Sir Walter Scott's poems. The largest lake is picturesque, island-dotted Loch Lomond, which lies at the foot of tall Ben Lomond. (*Ben* means *mountain* in Gaelic.) Loch Katrine lies in the romantic country called the *Trossachs*.

The Central Lowlands lie between the Highlands and the Southern Uplands. This region has most of the mineral resources and the best farming land in Scotland. In the Lowlands there are wooded hills, grassy slopes, wide rolling fields, and occasional lakes, such as Loch Leven, which is famous for its trout. Along the coast there are stretches of sandy grass called *links*. The game of golf was first played in these fields.

The Southern Uplands is a region of grassy moors broken by low green hills and occasional masses of rock which form cliffs. The Uplands have valuable farm and pasture lands. In the south the Uplands rise to the Cheviot Hills, which form the southern boundary of Scotland.

**Rivers and Bays.** The Clyde is the most important river of Scotland. The river was once narrow and shallow, but it has been deepened and widened so that ocean steamers can now land at Glasgow. The largest rivers of Scotland run east to the North Sea. They include the Spey, the Dee, the Forth, the Tweed, and the Tay, which has a greater volume of water than any other river in Great Britain.

Scotland has a longer coast line than that of England, for it is broken by many bays and indentations. On the west coast, cliffs rise from the sea in a great rock wall, or stick out sharply into the water. Many narrow bays, or *sea lochs*, reach far inland. Tall pillars of rock called *stacks* stand high and bare in the waters near the coast. Rocky wind-swept islands lie off the coast. Wide openings along the southern coast are called *firths*. The Firth of Clyde is the most important of these. The Firth of Forth and the Firth of Tay are on the eastern coast. North of them, Moray Firth makes a deep cut into the land. On the extreme northeast, Scotland meets the sea in a broad, level moor.

**Climate.** Scotland lies in the same latitude as central Labrador. The summers are cool, and the winters are cold, especially in the inland districts. But in general the climate is not very severe for a country which lies so far north. The oceans around Scotland help to make

its climate mild. Moist winds from the Gulf Stream warm the western coast.

The rainfall is heavy in the western Highlands, where it averages 100 inches a year, and reaches an annual 150 inches at the top of Ben Nevis. The eastern slopes and shores of the Highlands are drier. Here the yearly rainfall ranges from 25 to 60 inches.

**Natural Resources and Conservation.** Scotland is far from wealthy in its natural resources. Five sixths of the land can not be used for farming. Some forests were planted after World War I, and are now sources of lumber and wood pulp. Fish in the streams and lakes and along the eastern coast provide an important source of food. Deposits of coal, iron, and oil shale are found in the Lowlands. In the Highlands, the rapid rivers are used to produce electric power.

### The People and Their Work

**Population:** Estimated 5,030,000. *Density,* 163 persons per square mile. *Distribution,* urban, 80 per cent; rural, 20 per cent.

**Chief Products:** *Agricultural,* oats, turnips, barley, hay, fruits. *Pastoral,* sheep, cattle, ponies. *Mineral,* coal, iron, oil, shale, lead, clay, limestone, granite, slate. *Fisheries,* cod, herring, haddock, salmon, whale, seal. *Manufactured,* ships, textiles, iron and steel products, chemicals, burlap, lace, whisky, marmalade, jam.

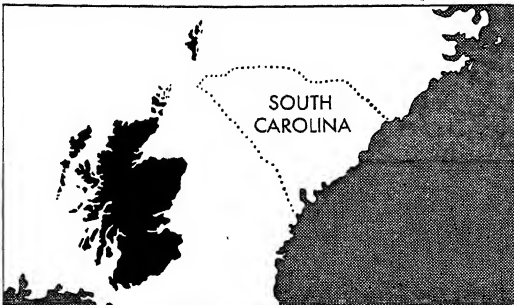
**The People.** Scotland has a population about the size of that of the state of Michigan. Ninety-two out of every hundred persons in Scotland are Scottish. About seven out of a hundred are Irish or English. Less than one in a hundred comes from a country outside the British Isles. Two thirds of the people of Scotland live in the Lowlands, which take up only one tenth of the country's area.

The Scottish people are of mixed origin. Historians know little of the earliest inhabitants. Some historians believe they were a strongly-built, black-haired people much like the Basques of Spain. A thousand years before Christ was born, tall, fair Celtic invaders entered Britain and moved north. They brought with them bronze tools and the Gaelic language. When the Romans conquered Britain in the first century A.D., they called the inhabitants of Caledonia *Picts*, or *painted men*. The Picts probably were descended from the original inhabitants, although their culture was Gaelic.

The Scots left Northern Ireland in the early 500's and came to Scotland. In the late 500's, Anglo-Saxon invaders from Germany settled in colonies on the eastern shores of Scotland. Finally, in the 800's and 900's, Norsemen made settlements on the northern islands and in the north and east.

The ancient culture of Scotland gained something from all these peoples. But the clan system, which was typical of the Scottish way of life, came from the Picts and Scots. Clans still play an important part in the social life of the Highlands. See **CLAN**.

**Language.** Gaelic was the language of the Highland Scots until Scotland and England were united in 1707. (See **GAELIC LANGUAGE**.) The people in the Lowlands spoke a Middle English dialect much like that spoken in northern England. Today, only a few people in the far-away parts of Scotland still know Gaelic. Most of the Scottish people now speak the English language. They speak it in their own way. They emphasize the "r"



Area of Scotland (Black) Compared with South Carolina

sounds rather sharply, and use many words of their own. Well-known Scottish expressions include "wee" for small, "bairn" for child, and "frae" for from.

**Agriculture.** Farming is not very important in Scotland because so little of the land can be farmed. Large estates have existed since early times and are still found in the Highlands and Southern Uplands. The number of medium-sized farms increased after World War I.

Heavy cultivation of the best land produces large crops of oats. Oats has long been the chief food of the Scottish people. Other important crops include turnips, which are used for stock food, potatoes, barley, and hay. Orchards of fruit trees grow in some parts of Scotland, and market gardening is carried on near the large cities.

**Stock Raising** is important in Scotland. The grass-covered moors of the Southern Uplands and the Highlands cover almost half of the country. About 7,500,000 sheep graze under the watchful eyes of Scottish sheep dogs, or collies. There are about 900,000 cattle. Many of them are fine breeds such as Kyloe, Ayreshire, Galloway, and Polled Angus. Clydesdale draft horses and Shetland ponies are important Scottish farm animals.

**Fisheries.** Aberdeen is the center of the fishing industry. Fleets of well-equipped steam and motor trailers have taken the place of the old sailing craft. They fish over large areas of the North Sea as well as in the coastal waters. The chief kinds of fish caught are cod, herring, and haddock. Big companies operate large ships and carry on the salmon, whale, and seal fishing.

**Minerals.** The foundations of Scottish industry are the coal and iron mines of the Lowlands. Most of the coal comes from Lanark and Fife counties. Ayr and Renfrew counties produce most of the iron. Millions of tons of shale, which yields shale oil, are taken from West Lothian County. Great Britain has almost no petroleum, so Scottish shale oil is important.

**Manufactures.** Nearly three fourths of the Scottish people earn their living by trade and industry. Glasgow is the center of the iron and steel industry, which produces about a seventh of the total output of the United Kingdom. The Clyde River is one of the great shipbuilding centers of the world. The textile industry is also important in Scotland. Scottish yarns and woolsens are famous throughout the world. Scotland has many cotton mills. Linen, silk, and rayon also are manufactured. Dundee is the center of the burlap industry.

Paper manufacture and printing are important industries, especially in Edinburgh. Dundee is famous for its marmalade and jam. Whisky distilleries are widely scattered throughout the country. The chemical industry has developed in recent years, and centers in Glasgow.

**Transportation.** Scottish highways were regulated by law as early as the 1200's. But these highway laws applied only to the Lowlands. Stagecoaches were introduced in the 1600's. The first good roads were built after Scotland united with England. Today all parts of Scotland have excellent roads. There is also a good system of canals. The Caledonian Canal runs through the valley of Glenmore. Small boats use this canal to cross the Highlands from ocean to ocean. The Forth and Clyde Canal serves the industrial area of the Lowlands and carries a large volume of freight.

Scotland has about 4,000 miles of railroads. They

have been combined with English lines to form two systems, the London Midland and Scottish Company, and the London and North Eastern Company. Both railroads run fast trains from English cities to the chief cities of Scotland.

**Cities.** Edinburgh, the capital of Scotland, and Glasgow, the largest city, are discussed under their own names in THE WORLD BOOK ENCYCLOPEDIA. Other important cities are described below.

**Aberdeen, AB er DEEN** (estimated population 180,800), is the third largest city in Scotland. It lies 130 miles northeast of Edinburgh along the North Sea. Aberdeen has an excellent harbor and is the chief northern port of Scotland. It is sometimes called the "Silver City by the Sea" because of its gray, gleaming buildings built of granite. Aberdeen is a great fishing and textile manufacturing center. Granite is quarried near by, and is an important export. The University of Aberdeen is a leading institution in the city.

Aberdeen was a thriving community in the 1100's. Its modern prosperity dates from the 1800's, when methods of polishing granite were discovered, and became the basis for industrial development.

**Ayr, air** (estimated population 41,600), is a seaport and summer resort. It is famous for its association with the poet Robert Burns. His birthplace, the village of Alloway, is only two and a half miles away. Ayr lies at the mouth of the River Ayr, on a beautiful bay of the Firth of Clyde, about 40 miles southwest of Glasgow. Its shining, sandy beaches draw many thousands of visitors every summer.

The old city is rich in historical associations. Scottish kings lived in Ayr during the 1100's. Many battles between English and Scottish forces took place here during the Scottish wars for independence.

**Dundee, dun DEE** (estimated population 179,000), is the fourth largest city in Scotland. It is a seaport on the eastern coast. Dundee lies on the northern shore of the Firth of Tay, about 50 miles northeast of Edinburgh. Like Aberdeen, Dundee is built chiefly of granite. It is the center of the British jute trade and produces more linen than any other city in Scotland. It also is famous for its candy and marmalade. Shipbuilding and engineering are other important industries. An iron bridge more than two miles long crosses the Firth of Tay at Dundee.

**Dunfermline, dun FERM lin** (estimated population 37,600), is famous as the birthplace of Andrew Carnegie, the steel manufacturer. Dunfermline lies 16 miles northwest of Edinburgh. Its name is Gaelic, and means *fort on the crooked linn*.

Dunfermline is full of interesting historical remains. It was important before 1066, when the Normans invaded England. Dunfermline was a favorite residence of early Scottish kings, and the birthplace of James I of Scotland and Charles I of England. The city began to be prosperous in 1718 when the weaving of linen damask was introduced.

After Carnegie became rich, he established the Carnegie Dunfermline Trust to bring "sweetness and light" to the community. He also gave Pittencrieff Park to the city. Through the fund a clinic, a craft school, a school of music, a physical-training college, and a public library were established.

**Inverness, IN ver NES** (population 22,582), lies 120 miles northwest of Perth on a harbor formed by the mouth of the Ness. It is the most important town in the Highlands and is the center of the Highlands trade in sheep and wool. Inverness dates from the 500's. The town received its charter in 1214.

**Paisley, PAYZ lih** (estimated population 92,700), lies seven miles southwest of Glasgow, on White Cart Water.



**Scottish Girls Greet the Herring Fleet** at Yarmouth, England. Each year during the herring fishing season, many

young Scottish women leave their homes to help handle the great catches landed at the English port.



**Scottish Farmers Unload Hay** with a simple derrick in the level and fertile valley of the broad Tay River.



Photos: Acme; Black Star; Sawders, Combine

**Supplies Are Brought to the Door** of this housewife of the Orkney Islands. The islands are bleak and storm-swept.



De Cou, Ewing Galloway

**Dryburgh Abbey, near Edinburgh, is the Burial Place of Sir Walter Scott, the Great Scottish Novelist**

It is one of the world's chief centers for the manufacture of cotton thread. In the 1800's famous Paisley shawls were important products of the city. Paisley is a modern, progressive community with fine public buildings, many parks, a famous race course, museums, libraries, and many factories.

**St. Andrews** (population 8,269) is an ancient town which is famous for its university and its golf links. The University of St. Andrews was founded in 1411, and is the oldest university in Scotland. The golf links at St. Andrews are among the finest in the world. St. Andrews is sometimes called the "capital of golf," because its "Royal and Ancient Golf Club," founded in 1758, decides the rules of the game.

**Social and Cultural Achievements**

**Education.** Scotland has better grade and high schools than any other part of the United Kingdom. As early as 1696 the Scottish Government provided for the establishment of schools in every parish. Unlike England, Scotland has never had many private schools. Since 1872 Scottish schools have been run by the Scottish Education Department. New education bills, passed in 1918 and 1944, extended the school system in Scotland. See ENGLAND (Education).

Scottish technical education is excellent. The Royal Technical College at Glasgow is the largest institution of its kind in the British Empire. The four Scottish universities have an attendance far larger in proportion to population than those of England. University education costs less than in England, and women are ad-

mitted on the same terms as men. The universities are aided by government funds and by the income from a \$10,000,000 Carnegie trust fund.

**Arts.** Scotland had its own national literature until the 1800's. English literature was influenced by the ballads and songs of the Scottish bards, the *Romances* and *Prophecies* of Thomas the Rhymer, and the tales of *The Bruce* by John Barbour. Famous Scottish poets of the 1400's and 1500's included King James I, William Dunbar, Gawin Douglas, and Sir David Lindsay. Later writers of Scottish birth made valuable contributions to English literature. They included Robert Burns, James Boswell, Sir Walter Scott, James Hogg, Thomas Carlyle, Robert Louis Stevenson, and James M. Barrie.

**Religion.** Scotland is the home and stronghold of the Presbyterian church. Most Scottish people belong to the Presbyterian Church of Scotland, which is the official church. There are smaller groups of Methodists, Congregationalists, Episcopalians, and Roman Catholics in the country.

**Government**

Scotland is part of the United Kingdom of Great Britain and Northern Ireland, and has the same king and Parliament. The government of Scotland differs somewhat from that of England. The established church is Presbyterian instead of Episcopalian, and the legal systems of the two countries are slightly different. In 1885 Scottish affairs were placed under the authority



of a Secretary for Scotland. This Secretary has been a full member of the British Cabinet since 1928. The Scottish office is in London, but offices dealing with such matters as agriculture, fishing, and health are in Edinburgh.

**Early Years.** The Romans invaded northern Britain in A.D. 78. They fought a number of campaigns against the Picts, but failed to conquer them. The Romans finally withdrew from Caledonia and had little influence on the country during the time they remained in Britain. The first important event in Scottish history was the conversion of the country to Christianity during the 500's. The religious unity of the country was completed in the 600's.

The first kingdom of Scotland was established in 844 when Kenneth Mac Alpin, king of the Scots, claimed the throne of the Picts. He and the kings who followed him waged many wars against the Angles and the Norsemen. King Duncan was the first ruler of the historical kingdom of Scotland. Duncan's reign ended when he was overthrown by Macbeth, who was one of his generals. Macbeth was an able ruler. He was killed in battle in 1057. Duncan's son, Malcolm III, followed Macbeth to the throne.

**Introduction of Feudalism.** Malcolm's wife Margaret, an English princess, brought English court life to Scotland. Her sons kept in close contact with England. The feudal system of land ownership spread across the border. (See FEUDALISM.) Towns were chartered and a parliament like that of England developed. The English language took the place of Gaelic. The reign of Alex-

ander III (1249-1285) was the Golden Age of Scotland.

**Struggle for Independence.** After Alexander died, a struggle for the throne took place. Edward I of England interfered. In 1292 he recognized John Baliol as king in preference to Robert Bruce, and claimed the overlordship of Scotland for himself. The Scottish nobles revolted and forced Baliol to make an alliance with France. Edward replied by invading Scotland. At the battle of Dunbar he won a great victory and proclaimed himself king of Scotland.

The Scots rose under William Wallace, the first popular hero of Scottish history. They won a number of victories before Wallace was betrayed and executed. Then Robert Bruce (1274-1329) took up the struggle. Bruce won a victory at the Battle of Bannockburn in 1314 and established Scottish independence. In 1328 Edward III recognized Bruce as Robert I, king of Scotland.

**The House of Stuart.** A struggle for the throne began when Bruce died, and ended when the Stuart family gained the Scottish throne. The nobles were put down by James I (1394-1437), but his successors had to deal with feuds among the Scottish nobles and warfare on the English border.

Scotland sought help in a close alliance with France, but this alliance meant war with England. In 1502 James IV sought to bring about an understanding with England by marrying Margaret Tudor, an English princess. But James soon returned to the old policy of the French alliance. He invaded England and was defeated and killed at the Battle of Flodden Field in 1513. James V was defeated by the English at Solway Firth in 1542. His daughter, Mary Stuart, was brought up in

**Shrill Notes of the Bagpipes Echo from the Hills Surrounding Oban, as a Band of Pipers Marches in Review**

Burton Holmes, Ewing Galloway



France and married to a French prince. See **MARY (QUEEN OF SCOTS)**.

**The Reformation in Scotland.** The Scottish leaders resented French influence and wanted to break away from the Catholic Church. With the secret help of Queen Elizabeth of England, they drove out French officials and soldiers. Under the influence of John Knox, the Scottish Parliament established a national Protestant church in 1560. The reformers disliked Mary, Queen of Scots, because she was a firm Roman Catholic. They also accused her of having plotted to murder her husband. Mary was forced to abdicate. She escaped to England in 1568 but was imprisoned and finally executed by order of Queen Elizabeth in 1587. Her infant son, James VI, was brought up as a Protestant, and the Presbyterian church was firmly established in Scotland.

**Union with England.** James VI was the great grandson of Margaret Tudor. When Queen Elizabeth died in 1603, he was the heir to the British throne. He ruled both countries, but their political and religious institutions remained separate. Both James and his son, Charles I, wished to reorganize the Scottish church. In 1638 the Scots signed a National Covenant and prepared to fight against Charles I. The English Puritans also turned against the king, and a civil war broke out in which the Covenanters supported Parliament against the king's party. But Cromwell's forces were victorious in the Battle of Dunbar (1650). Later Cromwell forced the Scots into union with England.

When the Stuarts returned to the throne in 1660, the Covenanters were cruelly persecuted. The Scots again joined with the English to drive out the Stuarts in 1688. Presbyterianism was restored, but bad feeling continued. The English became convinced that only a simple and fair union would preserve peace.

An Act of Union was passed by the English Parliament. It was pushed through the Scottish Parliament in 1707. The two kingdoms were united under the name of Great Britain. The Scottish church and the Scottish laws were left unchanged. The Parliament of Scotland disappeared, but the Scots were given representation in the British Parliament.

**Jacobite Rebellions.** Scotland benefited from the union with England. But many Scots, especially among the clans, remained loyal to James Stuart, who had been forced to abdicate in 1688. These Scots were called *Jacobites*. In 1715 the Jacobites rose in rebellion, but were defeated.

In 1745 the Highlanders rose again in support of Charles Stuart, the son of James, whom they called "Bonnie Prince Charlie." The clansmen overwhelmed the English troops in Scotland. Prince Charlie and his followers marched into England, but they were forced to retreat. The English armies forced a battle on Culloden Moor in 1746 and destroyed the hopes of the House of Stuart forever. Gallant Prince Charlie fled into the wild Highlands, and finally escaped to France. The English executed many clan chiefs, and forbade Highlanders to carry arms, wear kilts, or play the bagpipe. These restrictions remained in force until 1782.

**Modern Scotland.** The recent history of Scotland is the same as that of Great Britain. The Lowlands became one of the principal industrial centers of the

island in the 1800's. The Lowland Scots realized that economic prosperity depended upon union with England. The Highlanders were also reconciled.

The chief quarrels in modern Scotland have been in the field of religion. The Church of Scotland was broken up in 1843 and the Free Church of Scotland was established by some of its congregations. The bitter dispute died down as time passed, and the Church of Scotland was united again in 1929. F.H.H.

**Related Subjects.** The reader is also referred to:

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Miller, Hugh	Watt, James
Napier, John	Wilkie, David, Sir

#### CITIES AND TOWNS

Edinburgh	Glasgow	Gretna Green
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#### HISTORY

Baliol, John de	Duncan I
Bannockburn, Battle of	Gael
Bothwell, James Hepburn	Knox, John
Bruce, Robert	Macbeth
Caledonia	Macdonald, Flora
Covenanter	Mary (Queen of Scots)
Darnley, Henry Stuart	Pict
David	Wallace, William, Sir

#### ISLANDS

Hebrides	Orkney Islands	Shetland Islands
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#### PHYSICAL FEATURES

Ben Lomond	Firth of Clyde	Minch
Ben Nevis	Firth of Forth	Ness, Loch
Cheviot Hills	Forth River	Solway Firth
Clyde River	Grampian Hills	Tay River
Doon River	Inchcape Rock	Trossachs
Fingal's Cave	Katrine, Loch	Tweed River
Firth	Loch Lomond	

#### UNCLASSIFIED

Abbotsford	Flag (color plate, Flags of
Bagpipe	British Commonwealth
Clan	of Nations)
Curling	Golf (History)
Dress (Great Britain;	Haggi
color plate, Europe)	Paisley Pattern
	Tartan
	Tweed

#### Questions

- Why is Scotland sometimes called Caledonia?
- What are six of the country's most famous products?
- What are the natural regions of Scotland? Which is most important?
- What outdoor sport began in Scotland?

What is the meaning of each of these terms: (a) glen? (b) loch? (c) moor? (d) strath?

What is Scotland's chief crop? What other crops are raised?

Which Scottish city is sometimes called "the Silver City by the Sea"? Why?

What famous American capitalist was born in Dunfermline?

Who was "Bonnie Prince Charlie" and what part did he play in the history of Scotland?

**SCOTLAND YARD** is the headquarters of the London Metropolitan Police. The name *Scotland Yard* is often used to mean a special department of the force called the *Criminal Investigation Department*, or C.I.D. The



Black Star

**Scotland Yard** is the detective department of the London Metropolitan Police. Detectives from the "yard" were pioneers in scientific crime detection. These two crime experts are taking pictures of a footprint left by a burglar.

C.I.D. is one of the most famous organizations of detectives in the world. Detective story writers have made Scotland Yard men the heroes of many thrilling tales.

Scotland Yard gets its name from the building in which the London police were housed until 1890. This was an ancient structure where visiting Scottish kings and ambassadors stayed between the 900's and the 1100's. The Metropolitan Police moved into a group of modern buildings on the Thames Embankment in 1890. The new headquarters were named New Scotland Yard by Police Commissioner James Munro. J.J.F.

**SCOTT, CYRIL MEIR** (1879- ), is an English composer. He was born at Oxtou, Cheshire, and at an early age showed talent for composition. When Scott was twelve he was sent to study at Frankfort with Ivan Knorr. In 1898 he returned to England and first settled in Liverpool as a piano teacher and composer. Scott's works for orchestra and for piano soon attracted attention. A deep interest in Oriental philosophy later brought about a change in Scott's style. His music adopted the impressionism, lack of tonality, and rhythmic freedom of modern music. Scott's works include compositions for orchestra, concertos, piano music, and songs. He also published poetry and books on the relation of music to philosophy. F.B.

**SCOTT, DUNCAN CAMPBELL** (1862-1947), was a Canadian poet and historical writer. He was one of the editors of *The Makers of Canada*, a series of biographies of historical figures, and wrote the life of John Graves Simcoe which appears in the series. Scott was born at Ottawa, Ontario, and attended Stanstead Wesleyan College. In 1879 he entered public service as a clerk in the Department of Indian Affairs. From 1913 until he retired in 1932, he was deputy superintendent-general of the department. W.S.W.

**His Works** include the books of verse *The Magic House*, *Labour and the Angel*, *New World Lyrics and Ballads*, and *Green Cloister*; and the novels *In the Village of Viger* and *The Witching of Elspie*.

**SCOTT, EDNA LYMAN.** See STORYTELLING.

**SCOTT, FREDERICK GEORGE** (1861-1944). See CANADIAN LITERATURE (History of English-Canadian Literature).

**SCOTT, GEORGE HERBERT** (1888-1930). See DIRIGIBLE (British Dirigibles).

**SCOTT, HUGH LENOX** (1853-1934), was an American soldier and Indian fighter who served as chief of staff of the United States Army from 1914 to 1917. Scott was born in Danville, Ky., the son of a great-granddaughter of Benjamin Franklin. He was graduated from the United States Military Academy in 1876 and for twenty-seven years led an adventurous life as a cavalryman in the Far West. After the Spanish-American War he was appointed adjutant general of Cuba, and in 1903 was made governor of the Sulu Archipelago in the Philippines.

On Scott's return to the United States, he was appointed superintendent of the United States Military Academy. When the United States entered World War I, Scott was past the age limit for active service, but he was given command of the 78th Division and served in France. F.T.M.

**SCOTT, ROBERT FALCON** (1868-1912), was an English explorer. His experiences were the most disappointing in the history of polar exploration. Late in 1910 Scott sailed from New Zealand in the ship *Terra Nova* in an attempt to reach the South Pole. The party reached Cape Evans on Ross Island, where they set up headquarters. Scott also established supply stations along his route toward the Pole. Scott started with sledges over the ice in October, 1911. Snowstorms made his progress slow and difficult, but finally conditions improved. The men reached the Pole on January 18, 1912, but they found that Roald Amundsen had reached the pole only a month before. On the return trip, all five members of the party died from hunger and cold.

The bodies, as well as the records and diaries the men had kept, were later found. They were in the tent which had been set up as their last camping place. Scott's jour-

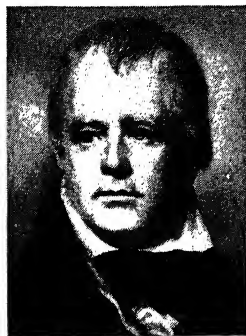


ACME  
**Captain Robert Scott**, English explorer of the Antarctic

nal had been written up to the day of his death. It gave what he considered the causes of their disaster. This sad account ended with an appeal to the public. He asked for help for his family and the families of his companions. J.Cot.

**SCOTT, THOMAS** (died 1870). See RED RIVER REBELLION.

**SCOTT, WALTER, SIR** (1771-1832), was a Scottish novelist and writer of romantic poems. He was the greatest literary figure of his day, and one of the favorite writers of all time. His novels are no longer so widely



Brown Bros.

**Sir Walter Scott**, first great writer of English historical novels

read as they were in Scott's time, but they are noted as the first widely successful historical novels. Many other writers before him had tried to write historical novels, but none had succeeded so well in breathing the fresh air of romance into the dryness of the historical past. Scott's influence appears not only in the romantic novels of Alexandre Dumas but also in all historical novels written after him.

**Early Life.** Scott was born in Edinburgh, the son

of a dull and unimaginative lawyer. Scott's ancestors were all border chieftains, and the boy never tired of hearing tales of their daring raids. It was fortunate that he could find enjoyment in this way, for an illness that he had as a baby left him lame and unable to play like other boys. He was sent to his grandfather's farm to regain his strength, and spent days lying in the fields with an old shepherd, or listening to the stories his aunt read to him.

Scott was sent to school, but because of his limp he lagged behind the other boys. He lost interest in his work and his marks were not high. But Scott was very popular with his schoolmates, and his friends listened with delight to the wonderful stories he told. He was still interested in romantic poems and stories and had made a collection of books on these subjects. His favorite book was Thomas Percy's *Reliques of Ancient English Poetry*. This book had great influence on the poems he later wrote.

**The Practice of Law.** Scott's father was determined that his son should be a lawyer, and he sent Scott to the University of Edinburgh. Scott had no liking for law, but he attended his classes and in 1792 passed the bar examinations.

Scott's law practice was never very large, but he earned enough to make a living. In 1797 he married Charlotte Charpentier, the daughter of a French refugee, and the two were very happy. In 1799 Scott was appointed sheriff of Selkirkshire, and a few years later he received the position of clerk of the Court of Session. These positions assured him a steady income, and he was able to give up law and devote himself to writing.

**Beginning of Literary Career.** His first works appeared in 1796. They were translations from the German

of Gottfried Bürger's *Lenore* and *The Wild Huntsman*. Three years later Scott published a translation of Johann Goethe's *Götz von Berlichingen*. He also published several ballads, but none of these attracted much attention.

For years Scott had been collecting Scottish border poetry, and in 1802 and 1803 he published two volumes of this large collection. This work, *Minstrelsy of the Scottish Border*, brought him some favorable notice, but it was not until 1805 that he really became famous. In that year he published his first great work, the long poem called *The Lay of the Last Minstrel*. *Marmion* followed, and was even more popular. His *Lady of the Lake* was such a favorite that crowds of tourists visited the scenes it described.

**Scott's Novels.** For some time Scott had been seeking a broader form of expression than poetry, and in 1805 he started the novel *Waverley*. But his publishers were more interested in his verse and he put it aside. The poems that followed *Lady of the Lake* were not so good as his earlier works. Scott decided to give up poetry and finish *Waverley*. In 1814 the novel appeared without his name attached and was a great success. The identity of the author was widely discussed. Many people guessed that Scott had written the novel, but he never admitted it until 1827.

The volumes of the long series of *Waverley* novels appeared in rapid succession. Two volumes often appeared in one year. It seemed almost impossible that Scott could produce them, and at the same time attend to his official duties, play the gracious host at his castle Abbotsford, and write the other works to which he signed his name. But he worked hard and rapidly. Scott never thought too highly of his novels, and wrote them more for the money they brought him than for fame.

**Financial Troubles.** The sale of Scott's novels brought him about \$50,000 a year, and he was able to live very comfortably as a country gentleman at Abbotsford. But his good fortune did not last. Years before, he had become a partner in the printing firm of James Ballantyne and Company, and more than once he had been called upon to save the firm from difficulties. In 1826 the great publishing business of Constable and Company failed and many of the smaller firms that were linked with it failed also. Scott's firm went bankrupt and owed its creditors about \$600,000. Scott did not have to take the entire responsibility of paying off the company's debts, but his sense of honor made them seem to him to be personal debts. In the next five years he drove himself at top speed, writing novel after novel in an effort to pay off these debts.

Within two years, he paid his creditors \$200,000. But in 1830 his health broke under the strain and he had to leave Scotland. A Mediterranean cruise only made his health worse and he begged to be taken back to Abbotsford before he died. After he had suffered several paralytic strokes, his mind began to fail, and he began to imagine that he had finally paid off all of his debts. Scott died soon after. Fifteen years later his debts were actually paid off by the sale of his copyrights. L.U.

See also ABBOTSFORD; LOCHINVAR.

**His Works** include *Ivanhoe*; *Guy Mannering*; *The Heart of Midlothian*; *Kenilworth*; *Quentin Durward*; *Rob Roy*; and *The Talisman*.

**SCOTT, WALTER DILL** (1869- ), is an American educator. He was president of Northwestern University from 1920 to 1939. He was born in Cooksville, Ill., and was graduated from Northwestern. He received his doctor's degree at the University of Leipzig in Germany. From 1901 to 1920, he was professor of psychology at Northwestern.

E.W.KN.

**His Works** include *Increasing Human Efficiency*; *Stabilizing Business*; *Man and His Universe*; and *Society Today*.

**SCOTT, WINFIELD** (1786-1866), was a famous American soldier. His men affectionately called him "Old Fuss and Feathers" because of his love for colorful military ceremonies and uniforms.

Scott was born near Petersburg, Va., and was educated at William and Mary College. He studied law and was admitted to the bar in 1807. But a year later he gave up the practice of law and joined the army. When the War of 1812 broke out, he was made a lieutenant colonel and sent to the Canadian border. Scott was captured at the Battle of Queenston Heights, but the British later freed him in an exchange of prisoners. He fought again at the battles of Chippewa and Lundy's Lane, and when the war ended he was given the rank of major general.

During the next twenty-five years Scott took an active part in army affairs. He prepared the first complete manual of military tactics in the United States Army. In 1841 he was appointed general in chief of the army.

When the Mexican War broke out in 1846 Scott was given command. He won victories at Veracruz, Cerro Gordo, Contreras, Churubusco, Molino del Rey, Chapultepec, and Mexico City. He returned from war a national hero and ran for President in 1852 on the Whig ticket, but was defeated by Franklin Pierce. Scott was appointed lieutenant general in 1855 and retired six years later.

N.G.G.

**SCOTT-GATTY, ALFRED SCOTT.** See EWING, JULIANA HORATIA GATTY.

**SCOTTI, SKAWT tee, ANTONIO** (1866-1936), was an Italian baritone. He sang with the Metropolitan Opera Company of New York City from 1899 to 1933.

**SCOTTISH EPISCOPAL CHURCH.** See ANGLICAN.

**SCOTTISH RITE.** See MASONRY.

**SCOTTISH TERRIER.** This breed of dog was first raised in the Scottish highlands. It is the only breed with the official name of Scottish terrier. But the cairn, skye, and west highland white terriers are also native to Scotland.

The Scottish terrier is a small dog with short legs and a chunky body. It weighs about 20 pounds. It has a hard wiry coat, and a long head with small upright ears. It carries its tail erect. The colors of this dog may be plain black, wheat, sandy, steel gray, or brindle. The Scottish terrier is brave, and likes to hunt rats and other small animals. It is modest and devoted to its master.

See also Dog (color plate, Terriers).

S.E.M., JR.



Brown Bros.

**General Winfield Scott** led the U.S. forces in the war against Mexico.

**SCOTTS BLUFF.** See NATIONAL MONUMENT; NEBRASKA (Other Interesting Places to Visit).

**SCOTTSBLUFF,** Neb. (population 12,057), is the trading center for one of the richest farming regions in the state. The city also is an important meat producing, poultry packing, and sugar processing center for western Nebraska. Scottsbluff was named for Hiram Scott, a fur trader.

The city lies on the North Platte River, at the foot of Scotts Bluff Mountain. Lincoln is about 430 miles to the southeast. Nature has provided abundantly for fishing and hunting in this area of Nebraska.

The irrigated farm lands surrounding Scottsbluff produce sugar beets, potatoes, corn, and wheat. Scottsbluff is the county seat of Scotts Bluff County.

G.W.R.

See also NATIONAL MONUMENT.

**SCOTUS, SKO tus.** See DUNS SCOTUS, JOHN.

**"SCOURGE OF GOD."** See ATTLA.

**SCOURING RUSH.** See HORSETAIL.

**SCOUTMASTER.** See BOY SCOUTS OF AMERICA (Organization).

**SCOUTS AND SCOUTING.** See BOY SCOUTS OF AMERICA; GIRL SCOUTS; HOBBY (Books about Hobbies [Camping and Scouting]); also names of scouts, such as CARSON, "KIT" CHRISTOPHER; CROCKETT, DAVID.

**SCRANTON, Pa.** (population 140,404), is the largest city in the Pennsylvania anthracite coal region, which is the greatest coal region of its kind in the world. The Scranton region ranks second only to Paterson, N.J., in the manufacture of silk. The city is the third largest in population in the state. It was named for the Scranton family, which founded an iron works here in 1840.

Scranton lies in northeastern Pennsylvania, 134 miles from New York City and 18 miles northeast of Wilkes-Barre. The city is set in a deep valley that is closely bordered by ridges of the Allegheny Mountains.

The coal beds here are wider and of greater thickness than in most places, and so near the surface that some cave-ins occurred within the city before the situation was fully realized.

**The People.** Work in the coal mines brought people of several European nationalities to the Scranton region at different times. The first settlers were the Welsh, the Germans, and the Irish. Later came the Poles, Czechs, Italians, and Lithuanians. Today, however, the city does not have an unusually large population of foreign born persons.

**Cultural Life.** Scranton is the home of the International Correspondence Schools, the largest of their kind in the world. The University of Scranton and Marywood College for Girls (Catholic) are also situated in the city.

**Industry and Trade.** The production of coal in the Scranton region amounts to twenty million tons in some years. The city is an important wholesale and retail center for northeastern Pennsylvania. Mills in Scranton produce rayon, lace, and other textiles. Iron manufacture, which was responsible for the city's development, is today represented chiefly by metal products of use in connection with the coal mining and textile industries.

**History.** The first settlers came to this region in the 1780's. As late as 1840 there were only five houses in the



community. In that year, however, Scranton began to grow. The first railroad entered the town in 1851. Scranton became a borough in 1853 and a city in 1866. In government it is classified in Pennsylvania as a city of second class A. It has a mayor, controller, and five councilmen, elected by the voters. R.O.H.

**SCRANTON, UNIVERSITY OF**, is a Catholic men's school in Scranton, Pa. It is operated by the Jesuits. Courses are offered in the liberal arts and sciences. Special emphasis is placed on premedicine, pre dentistry, and business administration. The university was founded in 1888 and has an average annual enrollment of about 580. W.C.N.

**SCREECH OWL**. See BIRD (illustration, Birds — the Friends of Man); OWL (Important Owls).

**SCREEN GRID TUBE**. See RADIO (Radio Tubes).

**SCREW**. A screw is an inclined plane wrapped around a cylinder or a cone. The screw is known in mechanics as a *simple machine*. A simple machine is one which is driven by only one force. The screw has two main parts. The spiral part that sticks out from the cylinder or cone is called the *thread*. The cylinder or cone itself is called the *body*. The threads of the screw are at an angle to the center of the body, which is known as the *axis*. As the screw is turned once completely, it raises whatever load or weight is being turned on the screw one complete thread. The distance between one thread and another is called the *pitch*. One complete turn, then, raises the load the distance of the pitch. If a screw has 5 threads in 1 inch, the pitch is equal to  $\frac{1}{5}$  inch.

The main purpose of the screw is to raise a load over the threads of the screw by applying as little force as possible. The advantage of the screw is that a small force can raise a load that is many times heavier than the force. The force is the weight applied to the lever that turns the screw or nut. As this lever is turned, it forms an

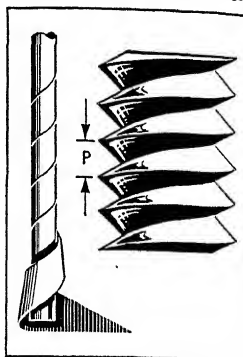
imaginary circle around the screw. The distance around this circle is called the circumference. The total work that is done by the lever is equal to the force that is applied to the lever times the circumference of the circle

made by the arm of the lever. This can be computed by the formula  $W = F \times 2\pi r$ , where  $W$  is equal to work,  $F$  is equal to the force, and  $2\pi r$  is equal to the circumference of the circle. It is sometimes desired to find how much load can be raised by a certain amount of force. This is figured by multiplying the force by the circumference of the circle formed by the lever. This product is then divided by the pitch. The formula for this is  $L = \frac{F \times 2\pi r}{P}$ , where

$L$  is equal to load,  $F$  is equal to force,  $P$  is equal to pitch; and  $2\pi r$  is equal to the circumference.

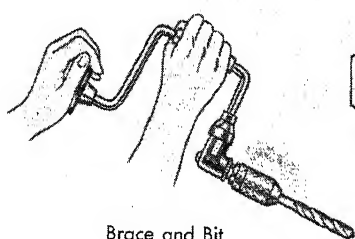
A screw always offers a certain amount of *resistance*. By resistance is meant an opposite force to that applied to the machine. An engineer or mechanic always keeps in mind this resistance in figuring the load of a screw.

The screw is used for many practical purposes. The most common types of screws are the wood screw and the screw found on the end of a bolt. Screws are also used to open and close nearly all vises. Jackscrews are used to raise buildings. The micrometer, which measures tiny distances, works by means of a screw which has very fine threads. There is still another type of screw

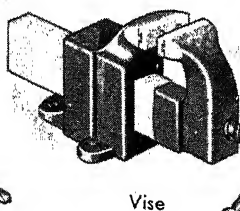


**The Screw** is a spiral inclined plane. At the left, paper is wrapped around a tube to illustrate this. The letter  $P$  shows the pitch of a screw.

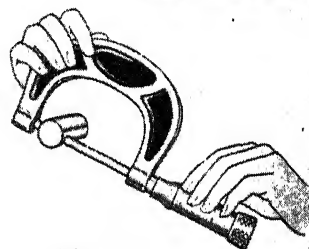
## SOME APPLICATIONS OF THE SCREW



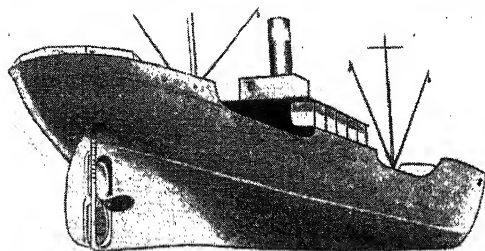
Brace and Bit



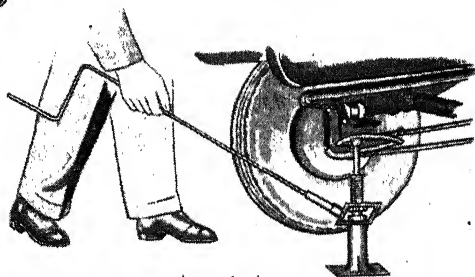
Vise



Micrometer



Propeller



Auto Jack

that is an endless screw. This screw is made up of a thread on an axle that fits into the teeth of a wheel. This device is called a *worm wheel* or *worm gear* and is sometimes used for raising very heavy loads. R.F.P.

See also GEAR (illustration); MACHINE (Jackscrew); PROPELLER.

**SCREW, ARCHIMEDEAN.** See ARCHIMEDEAN SCREW.

**SCREWORM.** See FLY (Flies That Harm Animals).

**SCRIABIN, skryah BIN, or SCRIBINE, ALEXANDER** (1872-1915), was a Russian composer and pianist. He is sometimes called the "Russian Chopin" because of his many beautiful pieces for the piano. Of his orchestral works, probably the best-known are *Poem of Ecstasy* and *The Divine Poem* (Symphony No. 3 in C major).

Scriabin was born in Moscow and studied music at the Moscow Conservatory. Later he taught piano there. In 1896 he toured Europe, playing his own compositions. From 1908 to 1910 he appeared throughout Russia as a pianist with Sergei Koussevitsky's symphony orchestra. G.B.

**SCRIBE.** A visitor to cities of the Old World, such as Istanbul, Turkey, would be sure to see old men sitting at little tables in public places, such as the courtyards of mosques, with writing material before them. Such a man is known as a scribe, or writer. Probably someone would be sitting near him, dictating a letter. In many parts of the world, even now, there are many persons who do not know how to write, and must therefore de-

pend upon scribes to conduct their correspondence.

Before printing came into wide use, books were handwritten by scribes. A nobleman of Florence, Italy, once kept forty-five scribes at work for two years copying books for his private library, and at the end of the time he had only about two hundred books.

Scribes are frequently spoken of in the Bible. The first scribes were military officers in charge of writing down the names of the recruits. Later they became copyists of the law, and finally they developed as a class of learned Hebrews who were required to expound and interpret the law and keep the official documents of the kingdom. In the time of Jesus, they were designated as doctors of the law. Some had special classrooms in the Temple, where they taught those who were to become rabbis. Most of the scribes belonged to the party of Pharisees, and they constituted the scholarly leaders of that body. Paul's teacher, Gamaliel, was a scribe. In Matthew 23:14-25, Christ is recorded as rebuking the scribes and Pharisees for their hypocrisy. E.S.W.

See also COMMUNICATION (illustration, Communication Old and New); PHARISEE.

**SCRIBE, skreeb, AUGUSTINE EUGÈNE** (1791-1861), was a French dramatist. His name is associated with the phrase, "the well-made play," which means a play which is valued more for its surface qualities of style than for its deepness of thought. Many of his plays showed the growing power of the middle class, but he also wrote about legends and stories of the Middle Ages.

Scribe was born in Paris, and was originally educated for the law. But his tastes were literary and he soon began to write for the stage. Scribe often worked with other writers and is believed to have written more than 400 dramatic productions. B.H.C.

His Works include the librettos for the opera *Fra Diavolo* and *Les Huguenots*.

**SCRIMMAGE, SKRIM ij.** See FOOTBALL.

**SCRIPPS, EDWARD WYLLIS** (1854-1926), was a famous American journalist. He started the first newspaper chain and founded the United Press Association. Scripps controlled a large number of newspapers and newspaper services.

Scripps was born on a farm near Rushville, Ill. At the age of eighteen he started work on the *Detroit Tribune* as an office boy. Six years later he began a newspaper of his own, the *Cleveland Penny Press*. This paper was the first of a chain which included papers in cities from the Middle West to the Pacific Coast. In 1917 Scripps's health failed, and he gave control of his newspaper holdings to his son, Robert P. Scripps. The chain is now known as the Scripps-Howard Newspapers, Inc. E.S.W.

See also UNITED PRESS.

**SCRIPPS COLLEGE** is a privately controlled women's school in Claremont, Calif. The plan of study is built around required courses in the humanities. Opportunities for partial self-support are available to qualified students. The college was founded in 1926. Enrollment is limited to 230 students, who are required to live in residence halls on the campus. F.H.A.

**SCRIPPS INSTITUTION OF OCEANOGRAPHY** is a school at La Jolla, Calif., for the study of ocean geography, plant, and animal life. Subjects studied at the



Newberry Library

**Saint Luke Was a Learned Scribe** who was educated in medicine and art, as well as literature. Noted as the writer of the Third Gospel, he is shown in this Flemish painting drawing a picture of the Virgin. Next to him is a goat and the wing of a bird which supplied him with quills.

school include the topography and composition of the ocean bottom, the physical and chemical properties of water, waves, currents, tides, and the formation of islands. The institution is controlled by the University of California and is the only one of its kind in the United States. It was founded in 1901.

**SCROFULA**, *SKRAHF yoo lah*, is a form of tuberculosis which attacks the lymph glands, and sometimes the bones and joints. These bones and joints become swollen and may break down with cheesy pus formation. Usually, the lymph glands in the neck are affected, but the infection may occur in any lymphatic gland. It usually occurs in young people. The treatment of the disease consists of sunlight, fresh air, good food, and warm and suitable clothing. Physicians generally prescribe cod-liver oil and similar tonics. The glands are sometimes painted with iodine to reduce swelling. A local operation may be necessary if an abscess forms.

In England scrofula was formerly called *the king's evil*, because it was believed that a victim could be healed if the king touched him. There is a well-founded story that Samuel Johnson, at the age of three, was taken to London to be touched by Queen Anne. The practice is supposed to have originated with the Anglo-Saxon king, Edward the Confessor, and was discontinued during the 1800's.

H.S.R.V.

See also FIGWORT FAMILY; TUBERCULOSIS.

**SCROLL.** The ancient Greeks, Romans, and Egyptians rolled their papyrus writings into large, ornamental rolls, or scrolls. These scrolls were their only books. The scrolls were rolled around rods made of wood, ivory, bronze, or glass. They were usually decorated at the ends by small globes, points, and other

**This Ancient Japanese Scroll** tells the history of a Buddhist temple called Yata-Dira. The unrolled section of the scroll shows

ornaments. Later, scrolls of parchment or animal skins were used. A curved design called scroll or scrollwork was developed from the appearance of the ancient scrolls.

**SCRUPLE** is a unit of weight used in the measurement of drugs. The scruple is equal to 20 grains. One scruple is also equal to  $\frac{1}{8}$  of a dram. There are 24 scruples in an ounce and 288 scruples in a pound (troy weight). The ancient Romans used the scruple as their smallest unit of weight. Today the scruple is used only by pharmacists and chemists.

E.G.Sr.

**SCUDDER, JANET** (1873-1940), was an American sculptor. She is noted for her fountains and figures of children. Janet Scudder was born in Terre Haute, Ind. She studied at the Cincinnati (Ohio) Academy, at the Chicago Art Institute, and in Paris.

M.C.C.

**Her Works** include "Frog"; "Fighting Boys"; and "Little Lady of the Sea."

**SCULL.** See ROWING.

**SCULPIN**, is the name of a large family of fishes which have large mouths, large heads, and bodies that taper sharply to the tail fin. They live in many parts of the world. Most of them live near rocky shores, but some live in very deep parts of the ocean and others live in fresh, inland water.

Most sculpins have spiny heads and fins and warty skins. Peoples in the Arctic regions eat them, although these fish have little flesh and are very bony. The sculpins eat small sea animals, and are greedy feeders. They often steal the bait from fishermen's hooks. Sculpins are themselves eaten by larger fish. They are also called *blob*, *bullhead*, *miller's thumb*, and *tide-pool johnny*.

L.P.Sc.

**Classification.** Sculpins make up the family *Cottidae*.

Buddha standing on a cloud before a group of Japanese. The writing says that Buddha ordered them to build a temple.

Freer Gallery of Art





## SCULPTURE

Metropolitan Museum of Art; Museum of Modern Art

**SCULPTURE.** Men have made figures from stone, clay, wood, and other materials since the very earliest times. They usually have shaped these figures like human beings or like the animals they saw around them, but sometimes the figures have imaginary forms. All such works are called *sculpture*.

Sculpture is one of the two oldest arts known to man. The other is painting. The earliest known examples of sculpture date from the Old Stone Age, or Paleolithic period, over 20,000 years before the time of Christ. Many pieces of ancient sculpture have been found in caves or old burial places.

### Types of Sculpture

**Composition and Form.** The sculptor creates a picture which has thickness as well as breadth and length. The picture may represent a great event, a noted person, a character or scene from a religious history or a myth, a real or imaginary being, or an idea. But the good sculptor usually does not attempt to make an exact copy of some living figure in stone or other material. Instead, he selects certain features and emphasizes or combines them so as to achieve a pleasing composition. For example, the sculptor may carve a heavy, squat figure of simple outline, few details, and with limbs close to the body. Such an arrangement makes the figure appear powerful, solid, and calm, and is said to be a *static* composition.

Another sculptor might show his figure in a position of movement, or with limbs outstretched. When one looks at such a figure, the eye follows the lines of the body and limbs. Since these lines lead in many directions in such an arrangement, it creates a feeling of movement, even though an inactive pose is shown. The sculptor can emphasize this feeling further by giving importance to details so that the outline is irregular. Such a treatment is said to be *dynamic*. It pleases those persons who enjoy change, movement, and excitement.

Sculpture may stand free of any background, so that one can see the figure from all sides. Such a piece is called *sculpture in the round*. It generally rests on a base or pedestal.

Another form of sculpture has raised figures against a background which is usually fairly flat. This form is called *relief sculpture*, or *sculpture in relief*. (See RELIEF.)

If the figures are in reverse, or lower than the surface of the background, the form is known as *hollow relief*, or *intaglio*, generally found only in small work like jewelry. When the background surface of relief sculpture shows scenes, such as trees, buildings, or even complete landscapes, it is called *pictorial relief*. This is the only form of sculpture in which anything besides figures of human beings or animals is used to any extent.

**Scale and Use.** Sculpture is one of the *fine arts*, which are created partly for the sake of pleasing the senses by their beauty. Sometimes sculpture also serves as an actual likeness or portrait of a person. Originally, sculptured figures probably served chiefly as idols or as statues of gods and goddesses. For this reason some religions object to all sculpture on the grounds that it might lead to idol worship.

A piece of sculpture may be a separate work, standing by itself, or it may be a part of a structure, usually a building. Then it serves as decoration, and sometimes even as part of the architecture. For example, a human figure may be used as a column. Female figures of this kind are called *caryatids*, and male figures, *atlantes* or *telamones*.

The size of a sculptured work can vary from the smallest miniature figures, or *figurines*, to huge figures like that of the Statue of Liberty or the gigantic heads of the Presidents on the Mount Rushmore Memorial in South Dakota.

**Figurines and Statuettes.** Small sculptures of this kind are designed as ornaments to stand on a desk, a table, or a mantelpiece.

**Monumental Sculpture.** Sculptures which adorn parks and squares, public buildings, or other places where the entire community can enjoy them are called monumental sculptures. If the figures are somewhat larger than life size, they are in *heroic* scale. If they are from several to many times larger than life size, they are in *colossal* scale.

Many monumental sculptures serve as memorials of great events or noted persons. A public monument usually lasts for a long time, so it should be appropriate both in design and setting. A wide appreciation of the principles of fine art can prevent the erection of ugly monuments, since most such monuments are built through public contributions or with public funds.

### The Sculptor at Work

**Processes and Materials.** Sculptors originally worked mostly with the materials of building, which were stone, wood, and clay, or with bone or ivory. After men learned to use metals, the sculptor also adopted these. The process of creating sculpture from wood, stone, bone, or ivory is called *carving*, and from clay or wax, *modeling*. Sculpture in metal is usually made by pouring hot, liquid metal into a mold made on a figure modeled in clay or wax, and allowing it to harden in the shape of the mold. This process is called *casting*.

**Carving.** The simplest way of carving is for the sculptor to look at the block of wood or stone and to imagine how the finished figure will appear. Then he hews or chips away the excess material until only the figure as he imagined it remains. Sculptors have provided aids to this process in many ways. Probably the very earliest sculptors looked for stones and logs that already suggested a human or animal figure. Then they simply added a few scratches or grooves to achieve an acceptable result.

Egyptian and early Greek sculptors probably cut the front view of a figure straight back from the front of the block of material. Then they cut the sides in the same manner. The result was a blocklike figure which needed only to have the edges and corners rounded and details added. But this process would serve only for single figures in the simplest of poses.

Complicated ideas were more difficult to work out by cutting directly into the stone or wood. The sculptor often made small models of clay or wax to serve as guides for cutting. This led to the practice of making a model as complete and exact as the intended sculpture, but on a smaller scale. The sculptor gives this *scale model* to skilled workmen, who first enlarge it to full size in clay and then copy it exactly in stone.

The workmen make the copy by setting a series of points which correspond to a similar series of points in the scale model. They use various mechanical devices to guide them. Nailheads serve as points in clay copies, and holes are drilled at points in the stone.

**Modeling.** Men early discovered that the fine clay of many riverbanks would take and hold any form their fingers gave it while it was still wet. When the clay dried, the form became set and fairly permanent, though it was easily worn and broken. They used it for pots, jars, plates, and other vessels called pottery.

In time the sculptor found that he could model graceful and more varied figures from clay with less work than he could carve them from stone or wood.

But clay which is soft enough to model falls down of its own weight when it is drawn out into thin shapes. The sculptor overcomes this by building a framework, called an *armature*, which supports the clay figure. The armature consists of wire for very small figures, and of tubing or pipe and wood for large figures.

Clay sometimes dries faster than the sculptor can finish his work. So he must keep it moist while working. Or he can use an oily kind of clay called *plastine*, which never dries or hardens.

Another disadvantage of clay is that it lacks durability in its natural state. But the potters taught the sculptors that clay could be hardened by baking, and

perhaps it could also be enhanced if covered with shiny, colorful glazes. Figures made in this way are called *terra cotta* (an Italian term meaning *cooked earth*), or *ceramic* sculpture. But the sculptor has great difficulty in producing anything larger than figurines by this process.

**Casting.** The sculptor found that he could make a durable reproduction of his large clay figure by casting it in metal. This process requires that a mold must first be made around the original clay figure. The sculptor usually makes this mold by mixing a white powder, called *plaster of Paris*, with water to form a thin paste. He covers the original figure with the paste, which shortly becomes much harder than clay and forms a mold.

Anything poured into such a mold will have exactly the same shape when it hardens as the original clay or wax model. But first the sculptor must get the mold off the model. He can do this by making the mold in one of several ways. If only one casting is to be made, he can make a *waste mold* in one or two sections. He digs the original model out of this bit by bit. Then he casts the figure and chips off the mold, or *wastes* it.

Or he can make the mold in sections, and remove the pieces separately so that the original model is not destroyed. Then he reassembles the pieces to form the mold for casting. After the cast is set, the mold can be pulled off piece by piece. A mold made by this method is called a *piece mold*.

The chief metal used for sculpture until modern times has been bronze. But sculptors now experiment with all sorts of material. Metal expands so greatly at high temperatures that figures cast from it must be hollow, unless they are very small. Otherwise they will warp and crack.

The sculptor casts a hollow figure by making a core inside the mold in one of two ways. One method is to line the mold with wax and then to fill the space inside the wax with a core of material similar to the mold. When the whole thing is heated, the wax runs out, leaving a space between the core and the mold into which the metal is poured. The French term, *cire perdue*, meaning *lost wax*, is applied to this process.

The second method is to pour the core material directly into a piece mold. The sculptor then removes the mold, and scrapes a layer of thickness from the core. After the mold is replaced, the metal is cast into the hollow space made by scraping. This process is called the *French sand* method because that is the material used for the mold and core.

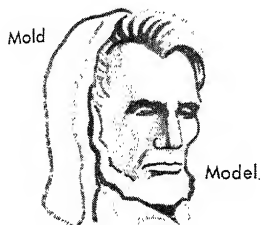
Plaster and cement casts are made in a similar way except that the figures need not be hollow, and so can be cast without a core. Cheap but lasting casts have been made in cement since the Renaissance. Such sculptures are used for architectural, garden, playground, and other decoration. When the cement is mixed with marble dust, these figures are sometimes called artificial stone casts.

**Other Processes.** Early metal sculpture was made of sheets of metal fastened together over a framework of wood. The sheets were first hammered into shape over a mold. This method is called the *repoussé* process. It is still used at times, especially for colossal works like the

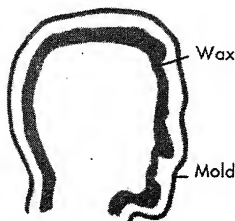


# HOW A BRONZE STATUE IS CAST

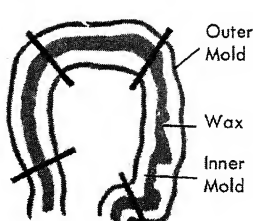
## CIREPERDUE PROCESS



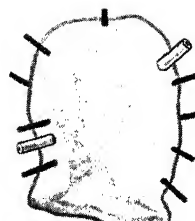
A mold of the original sculpture is made with a strong heat-resisting plaster.



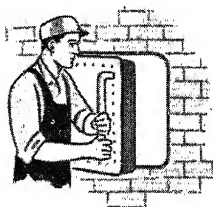
The inside of the mold is coated evenly with wax to make a thick film.



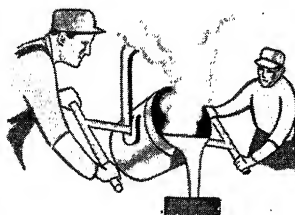
The wax-coated form is next lined with plaster to form the inside shell, or mold.



Pegs hold inner and outer sections together. Pipes carry away wax fumes.



The mold is next baked in a brick kiln. The wax melts and runs out of the mold.



Melted bronze is now poured into the hollow space formerly filled by the wax.



When the bronze has cooled and hardened, the plaster mold is broken off it.



The completed metal cast of the statue is given a color tone with heat and chemicals.

Statue of Liberty, which has a framework of steel.

New bronze is shiny and golden in color like a new penny. But moisture and gases affect the surface and change its color to reddish brown, green, or black in time. This surface film is called the *patina*. A good patina often improves the appearance of the sculpture. Sometimes it is produced artificially by applying heat and chemicals.

Practically all sculpture was colored in some way until the period of the High Renaissance. Wood and stone carvings were often completely colored, sometimes over a smooth plaster base called *gesso*. But the sculptor simply polished fine woods and stone and added color only for details, such as hair and eyes. Bronzes were not colored, but details were sometimes added in gold leaf, and enamel eyes were often set in. Plaster casts may be colored in many ways, or even thinly coated with metal by the process of electroplating.

### History of Sculpture

Sculpture is a durable art which usually outlasts less permanent forms of expression, such as painting. No art presents a more complete or clearer record of human culture than sculpture. The peoples of some periods have preferred it to other forms of artistic expression.

**Egypt.** The wonderful civilization of the ancient Egyptians produced a great art of sculpture over five thousand years ago. They actively continued to practice it during a period of about three thousand years.

In their sculpture-in-the-round, the Egyptians emphasized mass, or static composition, more than any other people of history. They made practically no attempt to represent figures in motion, but showed the figure in only a few simple, rigid positions. This Egyptian love of massive form led to the creation of colossal sculpture

many times life size. The best-known example is probably the Great Sphinx near the Pyramids at Gizeh.

All Egyptian sculpture had a religious purpose. Sculptured reliefs picturing religious ceremonies decorated the temples. Sometimes the reliefs showed the deeds of the king, who was regarded as a god. Scenes of daily life in a low relief adorned the walls of the tombs as part of the elaborate preparation for life after death.

The style of the sculpture clearly reflects the conditions of life in Egypt. The wealth and even the very life of the country depended on the annual rise and fall of the waters of the Nile River. These floods irrigated the narrow, surrounding strip of valley, and fertilized it with deposits of rich soil. This process took place with unending regularity and shaped a pattern of living which changed but little from year to year.

Egyptian sculptors worked in granite, basalt, limestone, marble, bronze, wood, and other materials. They skillfully cut and polished even the hardest stones with only simple tools.

Many examples of Egyptian sculpture remain, especially figures of rulers, gods, and goddesses. The Egyptians often placed monumental sculptures at the entrances or in the halls of their temples. Four colossal seated statues of Rameses II before the rock-cut temple at Abu Simbel are sixty-six feet high.

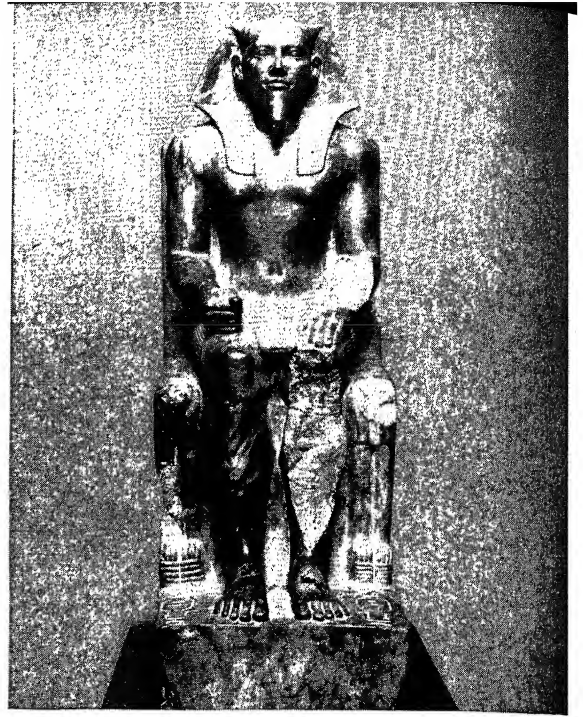
**Ancient Western Asia.** See ASSYRIA; BABYLONIA.

**Greece.** The earliest great culture on the continent of Europe developed in ancient Greece. The first culture to develop there was probably brought by the people of Crete, an island in the Aegean Sea. (See AEGEAN CIVILIZATION.) The Greeks began to invade territories around the Aegean Sea as early as 1400 B.C. By 1000 B.C., they had taken possession of Crete and other islands, as well as the mainland of Greece. They took

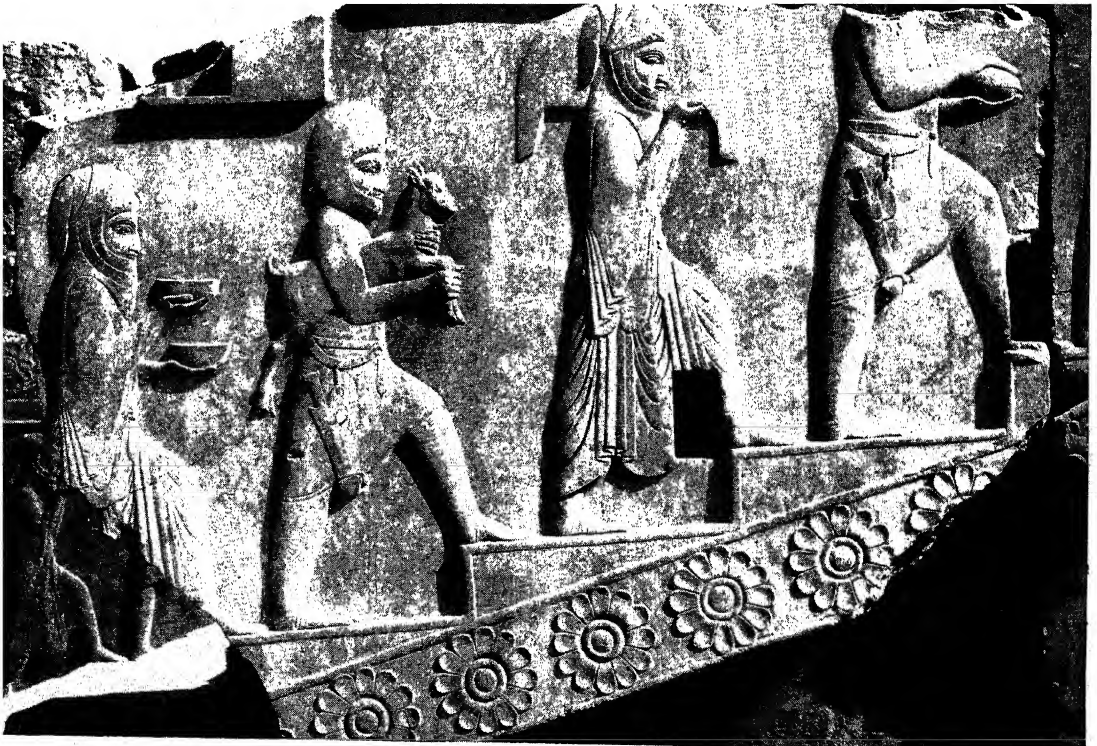
## ANCIENT SCULPTURE



**Queen Nefretete of Egypt**, about 1365 B.C., carved in stone, with crystal eyes and decorative coloring. This head shows the brief trend to naturalism in Ikhnaton's reign.

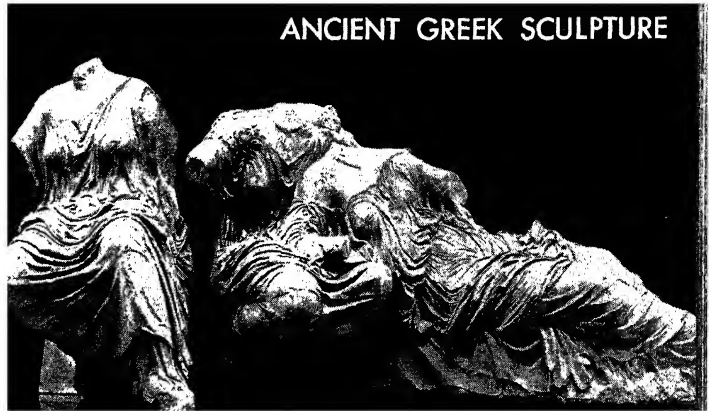


**Khafre, Egyptian King** and pyramid-builder in the Fourth Dynasty, 2900-2750 B.C. The power of a great ruler is expressed in this rigid figure, carved from the hardest stone.



**In the Palace of Darius at Persepolis**, long lines of tribute-bearers climb the stairs with offerings for one of the greatest of the Persian kings. Clear-cut and stiffly rhythmic, they portray

national types rather than individuals. Archaeologists have spent many years uncovering and studying works of art at the site of this ancient Persian capital.



## ANCIENT GREEK SCULPTURE

**Woman in Street Dress**, late Greek. **The Three Fates** were fitted into the triangular pediment of the Parthenon at Athens. Their figurins in clay, is realistic and informal. flowing drapery and graceful postures added movement to the rigid architectural design.



**Venus de Milo**, also called *Aphrodite of Melos*, has an expressive face and softly modelled surfaces.



**Archaic Sphinx**, a stiff and geometric figure from a gravestone of 540 B.C.



**Bronze Horse**, about 470 B.C., showing energetic naturalism.



**Alexander the Great**, in the style of Lysippos, his court sculptor.



**Victory of Samothrace** is a masterpiece of triumphant motion.

Metropolitan Museum of Art; Gendreau; Art Institute of Chicago; Erich S. Herrmann



Boston Museum of Fine Arts

**Roman Portrait Bust of a Child, Carved in Marble**

up many of the arts and ways of living of the more civilized Cretans and Egyptians. But they did not begin to develop their own form of artistic expression until about 600 B.C.

The earliest period of Greek sculpture is known as the *archaic* period. The figures are in static composition and show considerable Egyptian influence.

The Greeks had more interest in the study of mankind than any peoples before them. The sculptors naturally strived to make their figures of the human form as beautiful as possible. They established standards of proportion and types which still influence our ideas of human beauty.

Greek sculpture reached its highest point of development in the latter half of the 400's B.C. This period is known as the Golden Age, or as the Periclean Age, after Pericles, who then ruled Athens.

The leading sculptor of this period was Phidias. His most famous sculptures were the statue of goddess Athena in the Parthenon temple on the Acropolis at Athens, and the statue of Zeus in the temple at Olympia. Both these figures have been lost, but he was in charge of the sculptured decoration of the Parthenon and some of them, especially the pediments, may have been his work.

Other important sculptors of this period were Myron and Polyclitus. They chiefly made figures representing athletes victorious in the Olympic Games. Myron created the famous statue of the "Discus Thrower," or the "Discobolus," of which only copies remain. Polyclitus

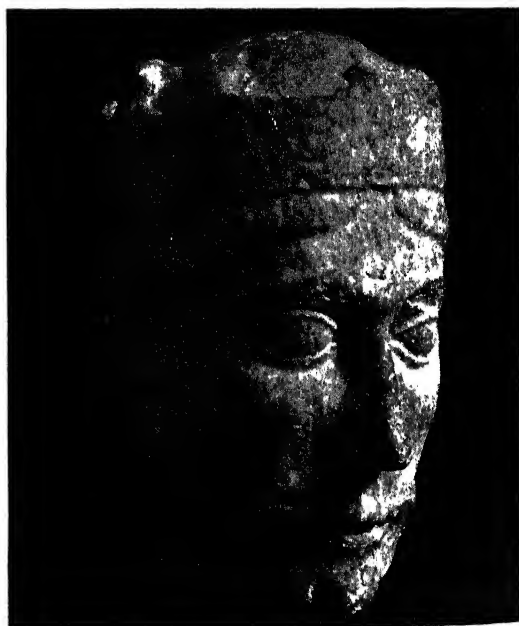
was supposed to have invented the standards of beauty which were applied to the human figure in the Golden Age.

The leading sculptors of the 300's B.C. were Praxiteles and Scopas. Praxiteles made the beautiful statue of "Hermes with the Infant Dionysus." This work is an example of the graceful poses and soft modeling that developed in Greek art after Athens was humbled in the Peloponnesian War. Scopas developed emotional facial expressions and dramatic poses instead of the calm features and quiet poses which were so much admired in earlier periods.

The most important sculptor following Praxiteles was Lysippus, a sculptor at the court of Alexander the Great. He is believed to have set the new standards of proportions for the human figure which resulted in taller and more graceful forms of sculpture. No work of his remains, but he achieved fame especially for his portrait busts of Alexander.

The conquests of Alexander the Great carried Greek culture into Egypt and the lands of Asia. Great cities such as Rhodes and Pergamum in Asia Minor and Alexandria in Egypt replaced Athens as the centers of art and learning. The artists blended local ideas with the Greek standards of beauty. The result was a varied and colorful art that is referred to as *Hellenistic*, from the word *Hellenes*, the name which the Greeks used for themselves. The sculptors of this period preferred active, dramatic poses. Such composition was carried to an extreme in the frieze of the Altar of Zeus at Pergamum. The most famous examples of Hellenistic sculpture include the "Winged Victory," or "Niké of Samothrace," and the "Venus de Milo." Other well-known works are the "Laocoön" group, the "Farnese Bull," and the "Dying Gaul."

The sculptors of some localities preferred common-



Metropolitan Museum of Art

**Romanesque Head of a King Made in France in the 1100's**



Art Institute of Chicago

**Early Gothic Sculpture**, showing "The Visitation" of the Virgin Mary (wearing crown) with Elizabeth, mother of Saint John. This work from Chartres, France, dates from the 1100's. Its vertical lines fit in with those of the cathedral.



Metropolitan Museum of Art

**Late Gothic Sculpture** in France is lighter and livelier. "Virgin and Child" are in a graceful, natural pose. Flowing curves replace the stiff vertical lines which characterized the sculpture of the early Gothic Period.

place subjects for their work, such as men wrestling, children playing, or old women going to market. Figures of this type were probably ordered by wealthy individuals to decorate their gardens or homes.

**Etruscan and Roman Period.** The early settlers of Italy were a people known as the Etruscans, who probably came from Asia Minor. They produced bronze and terra-cotta sculptures. The terra-cotta sculpture includes some life-size and heroic figures. Sculptures of these sizes are seldom achieved in clay, even today. Etruscan work shows considerable Greek influence.

The greatest achievements of the Romans were economic and military. Their forms of culture were largely copied from the Greeks. But Roman artists developed portrait sculpture to a point of importance and skill that has never since been surpassed.

**Romanesque.** Very little sculpture was made in Europe after the fall of the Roman Empire until about A.D. 1000. The round-arched buildings of the period from about A.D. 500 to 1150 resembled Roman architecture by contrast with later pointed-arched Gothic. Therefore, the period and style are often referred to as *Romanesque*. Romanesque sculpture appears almost en-

tirely as decoration on churches. The subject matter is religious.

The Romanesque sculptors carved highly decorative figures which show considerable imagination. But the features are of conventional types with little natural appearance. The favorite subject was the representation of Christ sitting in judgment.

**Gothic Period.** Sculptors continued to devote most of their work to church decoration during the period when the great Gothic cathedrals were built (about 1150 to 1550). Their work shows a large variety of subject matter. Much of it is religious, and figures of the Virgin Mary with the Christ Child were often used. But kings, queens, figures of the zodiac, and strange, imaginary creatures also appear. The faces of Gothic figures look more human than do those of the Romanesque period, but the figures still are longer and more slender than in life. But the sculptors did not attempt to create actual portraits. They skillfully blended the stone figures with the architectural forms of the buildings, so that the sculpture functions as part of the architecture.

**Italy.** The artists of Italy began to rediscover ancient Greek and Roman culture around 1300, when Gothic



art was flourishing in northern Europe. This i developed into a great renewal of creative effort, reached its height in the 1400's and 1500's. This movement is known as the *Renaissance*, a French term meaning *rebirth*, or the rebirth of classic culture.

*Early Renaissance.* Sculpture did not begin fully to reflect this new spirit until the 1400's. Yet a few sculptors were affected by it earlier than that. The work of Nicola Pisano (about 1210-1278?) shows classic influence blended with Romanesque style. His greatest masterpiece was the pulpit in the baptistery of the Cathedral of Pisa, which he adorned with reliefs representing scenes from the life of Christ. His son, Giovanni (about 1245-1320?), was also a distinguished sculptor.

The greatest Italian sculptor of the Renaissance during the early part of the 1400's was Donatello (about 1386-1466). His work marks the full development of the new spirit in the field of sculpture. In his statue of "David" he revived the ancient classic use of the nude figure. His statue in Padua, called "Gattamelata," was the first monumental figure on horseback since Roman times. He decorated the pulpits and singing galleries of churches in Florence and Padua with reliefs of dancing children like those often used in Roman decoration. But Donatello did not merely copy the Greeks and Romans. Instead, he learned from them to ob-

times was Michelangelo Buonarroti (1475-1564). He also excelled as a painter, an architect, and a poet.

Probably the greatest sculpture of Michelangelo is the "Moses and the Slaves" for the unfinished tomb of Pope Julius II. His tombs for two members of the Medici family are also noteworthy. The tomb of Giuliano de' Medici bears the famous figures of "Day" and "Night." These tombs stand in the New Sacristy of San Lorenzo, at Florence. The restless poses and strained muscles of his powerful figures reflect the insecurity and strife of the period.

*Baroque Period.* The Renaissance began to decline when artists lavished detail on their works: Their sculptures became examples of great technical skill. The style which resulted is known as *baroque*. The leading sculptor of the period was Giovanni Lorenzo Bernini

(1598-1680), who was also an architect. He designed the towering altarpiece in the great Church of Saint Peter at Rome. The metalwork of Benvenuto Cellini (1500-1571), author of a famous autobiography, is also notable.

*Neo-Classicism.* The movement in the early part of the 1800's to restore classic principles to art is known as *Neo-Classicism*. The leading sculptor who worked in this style in Italy was Antonio Canova (1757-1822). One of his best-known works is the reclining figure of "Venus," for which Pauline Bonaparte, the sister of Napoleon, posed. Canova also made a portrait statue

of Napoleon which is very well known.

*France.* The Gothic style dominated French art until about the 1500's, when the Italian Renaissance began to influence the culture of all Europe. The work of Michel Colombe (1430?-1512) was notable. Among his most important works was the tomb of Duke François of Brittany and his wife. Then Italian architects, artists, and sculptors came to France to decorate the palaces of the kings. French sculptors adapted the Italian style to create graceful, decorative figures such as those on the "Fountain of the Innocents," by Jean Goujon (1510?-1568?), in Paris.

François Girardon (1628-1715) was a French sculptor who was the leader of his time after 1665. He designed the tomb of Richelieu, as well as many public statues.

Jean Antoine Houdon (1741-1828) was an outstanding French sculptor who was especially noted for his portraits. He came to America to make a portrait statue of George Washington. He also made portrait figures of many other prominent people of the time, including Voltaire.

French sculpture developed along many different lines in the 1800's. François Rude (1784-1855) expressed the patriotic spirit of the Revolution in his reliefs on the



Metropolitan Museum of Art

**Salt Cellar** of gold, the Renaissance love of

, and ebony, by Cellini. It shows sculptural decoration.

Ghiberti

1400's, was less influenced

by the new movement. But his wonderful bronze doors on the baptistery at Florence inspired Michelangelo to name them the "Gates of Paradise."

Luca della Robbia (1400?-1482), worked in marble and bronze, but is famous chiefly for his glazed figures of terra cotta. He introduced this medium into Italian sculpture.

One of the pupils of Donatello was Desiderio da Settignano (1428-1464) of Florence. He produced works of delicate modeling and great elegance. His delightful bust, "Laughing Boy," has been a favorite subject for small-scale reproductions.

Another sculptor of Florence, Antonio Pollaiuolo (1429-1498), made a careful study of the appearance of the muscles while the body is in motion. He caught fleeting moments of tense action in his poses.

The powerful, stern statue of the soldier, Bartolomeo Colleoni, at Venice is one of the finest figures on horseback ever produced. It was designed by Andrea del Verrocchio (1435-1488), who was also a painter and the teacher of Leonardo da Vinci, one of the greatest of all the Renaissance artists.

*High Renaissance.* The great figure of the Italian High Renaissance and one of the leading sculptors of all



Michelangelo's "New Sacristy Madonna" forms a compact design of bodies arranged in opposite spirals.

## ITALIAN RENAISSANCE SCULPTURE



Colleoni, prince and military leader, rides his horse with pride and fierce energy in Andrea del Verrocchio's bronze.



"Laughing Boy" by Desiderio da Settignano is sculptured in marble with delicate surface modeling.



Singing Boys by Luca della Robbia. The youthful voices are vividly suggested by expressive, individual faces.

Art Institute of Chicago; Gendreau

Arch of Triumph in Paris. Small sculptured figures became popular. One of the best-known producers of small bronzes was Antoine Louis Barye (1795-1875), who made figures of wild animals. Jean Baptiste Carpeaux (1827-1875) created some of the sculpture decorations of the Opera House in Paris, and François Joseph Bosio (1769?-1845) carved bas-reliefs for the Column Vendôme in Paris, as well as portrait busts of Napoleon and others.

The outstanding French sculptor of the 1800's was Auguste Rodin (1840-1917). He chose such romantic subjects for his work as "The Kiss" and "Eternal Springtime." His romanticism affected his technique, which tended toward soft, irregular outlines and informal, open compositions trailing off into rough stone.

**Germany.** Sculpture never reached a position of such importance in the countries of northern Europe or in England as it did in Italy. Instead, the people of Teutonic, or Germanic, origin have best expressed their creative energies in other forms of art, such as literature and music. Yet these countries have produced some sculpture of great merit.

The German wood carvers of the Middle Ages were among the most highly skilled in Europe. Tilman Riemenschneider (1468-1531), perhaps the greatest German sculptor in wood, sat on the town council of his native Würzburg from 1504 to 1525, serving as burgomaster after 1520. One German, Claus Sluter (died about 1410), was court sculptor to the Dukes of Burgundy. Albrecht Dürer (1471-1528) was a noted sculptor as well as a painter.

Christian Daniel Rauch (1777-1857) studied at Rome and was advised by Canova and Thorvaldsen. Among other great works he made the great equestrian statue of Frederick the Great. Johann Heinrich von Dannecker was one of the group of artists whose work was important about 1800, in the period of Neo-Classicism. Friedrich Drake (1805-1882) was an outstanding pupil of Rauch. Adam Kraft (or Krafft) (1460?-1508) was a stone sculptor of Nürnberg who did many relief sculptures.

**England.** In the period of the late Renaissance in England, Nicholas Stone (1587-1647) worked with Inigo Jones in executing his architectural designs. He also sculptured the tombs of the poet John Donne and Sir Thomas Bodley, the diplomat. One of the best-known sculptors of England was John Flaxman (1755-1826), who brought the classical spirit into English art. John

Gibson (1790-1866) became the best-known of Canova's pupils in England. Alfred Stevens (1818-1875) created some noted monumental sculptures, including the "Monument of the Duke of Wellington," in Saint Paul's Cathedral: Edward Onslow Ford (1852-1901) was best known for his portrait busts and statues. Sir Alfred Gilbert (1854-1934) is noted for his seated statue of Queen Victoria for Winchester, the tomb of the Duke of Clarence, and a Memorial to Queen Alexandra.

John Henry Foley (1818-1874), an Irish sculptor, did many notable equestrian statues of such people as Sir James Outram, and Stonewall Jackson. He also designed the seal of the Confederate States of America.

**Denmark.** The sculptor, Bertel Thorvaldsen (1768-1844), represents the greatest figure in Danish art. He influenced the revival of the classic style more than any other sculptor since Canova.

**Africa.** For centuries the Negroes of central West Africa have produced remarkably fine wood carvings. The best examples were made probably in the 1600's and 1700's. The African Negro sculptor distorted natural forms to achieve highly decorative compositions. When these works were introduced in Paris in the 1800's, they greatly influenced the abstract style of art. The Negroes of Benin learned how to cast metal from the Portuguese and produced some fine bronze portrait heads.

**Asia.** Most of the sculptures of the countries of Central and Eastern Asia have a religious significance. The figure of Buddha has served as a favorite subject for sculpture. He is frequently represented as

seated figure, with legs crossed and hands folded, with one hand upraised.

Another favorite subject is the *bodhisattva*, or one who strives to attain the state of Buddha. The principal bodhisattvas are Maitreya, the future Buddha, a Avalokiteshvara, who became Kuan Yin, the Goddess of Mercy, in China, and Kwannon, in Japan.

Certain countries, especially China and India, possess rich cultural traditions long before the time of Buddha.

**India.** Buddha was born in India, and was first represented in sculpture by symbols. The familiar Buddha figure did not appear until hundreds of years after death. Some of the finest Buddhist sculptures of India date from the Gupta age, which began in A. D. 3. At this time Buddhism was already being absorbed by Brahmanism.



University Museum, Philadelphia

**Bronze Head of a Benin King** from southern Nigeria  
Africa shows the high artistry of the African natives.

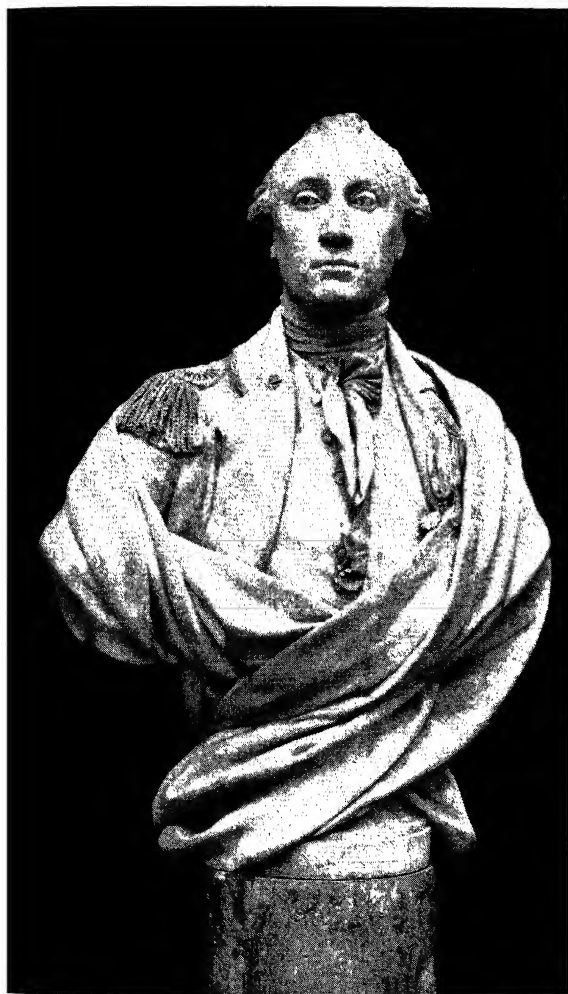


**"Senegalese Elephant"** by Antoine Barye has dramatic vigor as well as careful realism of anatomy.



## FRENCH AND ITALIAN SCULPTURE OF THE 1800'

Antonio Canova's **Statue of Pauline Bonaparte** is typically neoclassic—cold and formal, with studied grace of line.



Houdon's **Portrait of Lafayette**, like the one he made of Washington, is a faithful, observant characterization.



Metropolitan Museum of Art; Philadelphia Museum of Art  
Auguste Rodin's **"The Kiss"** suggests living flesh—smooth and moving—in contrast with rough and lifeless marble,

Buddhistic art came under the influence of Hellenistic culture in Ghandara (now Kandahar, in Afghanistan) after the conquests of Alexander the Great. A type of sculpture of extraordinary beauty resulted which is known as Greco-Buddhistic.

Great quantities of Brahmanistic sculptures decorate the temples, which often have every inch of surface covered with elaborate decorations. Many of these sculptures represent Hindu gods or goddesses.

Some of the Hindu systems of belief, or cults, are devoted to the worship of Vishnu or Siva. They are also worshiped in other forms as they appeared in one of their previous lives, or incarnations. Vishnu usually appears in sculpture as a figure of human form with four arms. He often stands or sits on a base in the shape of a lotus flower. One of the principal incarnations of Vishnu is as Krishna, in which form he is worshiped in India.

The Hindus consider Siva as the creator and destroyer of all things. Sculptures of Siva, dancing the dance of the universe, usually show him as a figure with four arms dancing on the body of a dwarf, who represents ignorance. A sculptured ring of fire sometimes surrounds the figure of Siva.

**China.** The ancient Chinese made careful prepara-

**The Dance of Siva** symbolizes this Hindu god's supposed power to destroy and restore the universe. His four hands and flowing hair contain various symbols of the cosmic energy at his command.

tions for the burial of their dead. Small clay sculpture of people and animals, stoves, carts, and other objects of daily life have been found in the graves of the Han period (206 B.C. to A.D. 220). Carved stone was also used to decorate or line the tombs. The designs show horses, carriages, dragons, men, and other figures drawn with amazing skill and imagination. One of the greatest sculptured monuments of China consists of nine enormous winged stone lions, which once guarded royal tombs near Nanking.

The Chinese continued to make figures for graves after Buddhism became established sometime around A.D. 150. The glazed clay grave figures of the Tang period (618 to 907) represent some of the finest art forms ever produced in China — spirited horses and riders, camels, smiling dancers, musicians, and court ladies.

Buddhism moved into China across Central Asia. The early Buddhists of Central Asia and Northern China built their temples in caves, in which they carved figures of Buddha and bodhisattvas, sometimes of colossal size. The Yun K'ang Caves at Shansi and the Lung Men Caves at Honan contain the greatest monuments of Buddhist sculpture in China.

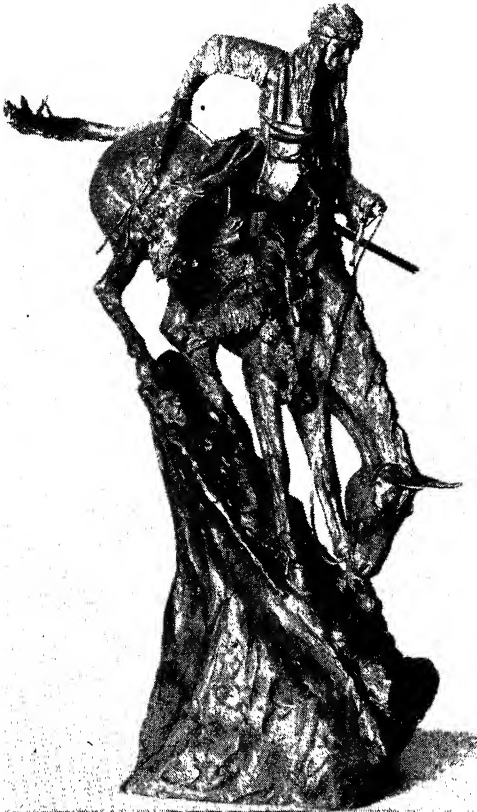
Much of the later Chinese sculpture lacks the vigor

**Kuan Yin, Chinese Goddess of Mercy**, is serene and placid in expression, with rhythmic draperies and a gently swaying posture.

G. T. Loo: Metropolitan Museum of Art







Frederic Remington's "Mountain Man" has the same sweeping action as have the artist's paintings of the Old West.

and originality of the earlier forms. The Chinese ranked sculpture far below painting and literature as an art, and so names of Chinese sculptors have not come down to us.

**Japan.** The Japanese islands contain almost no stone suitable for sculpture. Therefore the Japanese made their figures of metal, wood, and sometimes clay.

The art of sculpture entered Japan from China at the time Buddhism was introduced in the 500's. Nearly all Japanese sculpture was made for Buddhist religious purposes, except some late portrait sculpture. Most Japanese Buddhas wear a large, pointed halo, which represents the light radiating from the great teacher. The Japanese sculptors became highly skilled in the art of casting metals, especially bronze.

**The United States.** Very little sculpture appeared in the United States until the 1800's. But carving was done, even in the colonies. The carvers were craftsmen who produced such works as tombstones, weathervanes, and ship prows. They did not look upon their work as art, but their works sometimes show considerable artistic merit. An outstanding carver was William Rush of Philadelphia.

For the most part, sculpture in the 1800's followed the trends in Europe. Sculptors of the early 1800's worked in the Neo-Classic style then in favor in Europe. Among them were Horatio Greenough (1805-1852) and Hiram Powers (1805-1873). Horatio Greenough designed the Bunker Hill monument and made portrait sculptures of



Metropolitan Museum of Art

"The Bear Tamer" is the work of Paul Wayland Bartlett. Bartlett's statues are noted for their lifelike modeling.

many well-known Americans of the time. He made the colossal statue of Washington which stands in the Capitol at Washington, D.C. The best-known work of Hiram Powers is the statue called the "Greek Slave," but he also produced many portrait figures. Other sculptors of the period include William Wetmore Story (1819-1895), Randolph Rogers (1825-1892), and Harriet Hosmer (1830-1908).

John Rogers (1829-1904) developed an interesting series of small plaster and some bronze groups of simple, everyday subjects, treated in a sentimental manner.

Frederic Remington (1861-1909) created exciting bronze figures showing life in the western United States. He chose his subjects from such events as the Indian wars and cattle raising.

American artists flocked to Europe in the late 1800's. Most of them, especially the sculptors, merely imitated the prevailing European style and taste. Very little American sculpture of the 1800's shows any real creative talent, although some of it represents highly skilled work. Many public monuments erected in towns and cities of the United States during this period have no artistic merit. But the sculptors were not always entirely responsible for badly designed monuments. Public officials who bought such monuments often lacked any true understanding of artistic principles. They demanded that sculpture should be as realistic as possible, on the theory that the more closely a statue resembled

## MODERN SCULPTURE



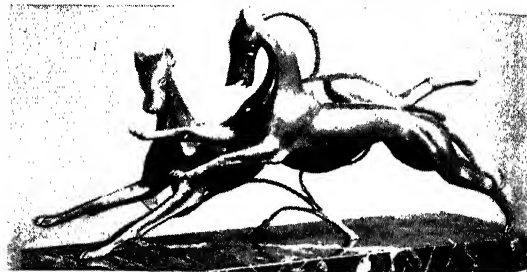
**Orpheus**, from a fountain by Carl Milles, is deeply grooved and modeled into tense, dynamic curves.



**Alfeo Faggi's "Dead Christ with Mary,"** or "Pietà," recalls the monumental dignity of Egyptian and medieval art.



Metropolitan Museum of Art; Art Institute of Chicago; Museum of Modern Art Permanent Collection; Whitney Museum of American Art  
**Brancusi's "Bird in Space"** gives an abstract **"The American Soldier"** by Jacob Epstein.



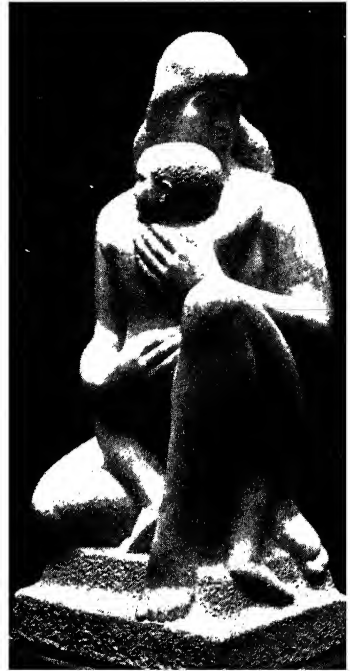
**"Playing Dogs,"** by Hunt Diederich, is a notable expression in bronze of rhythmic motion combined with graceful design.



up the light reflections, suggesting movement.



**"Girl Kneeling"** by Aristide Maillol eliminates small details to bring out a simple design of repeated masses and curving surfaces.



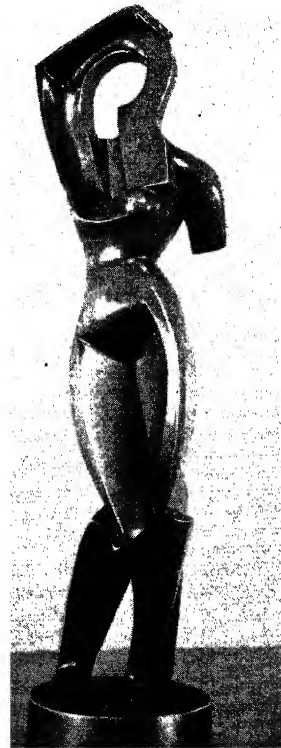
**"Mother and Child"** by William Zorach achieves a more complex design of masses and contrasting textures.



**"Indian on Horseback"** by Ivan Mestrovic is modern in its vigorous action, but archaic in its grooves of hair and ribs.



**"Dancer and Gazelles"** by Paul Manship is archaic in its precise rhythms of line, but has modern grace of movement.



Art Institute of Chicago; Peter A. Juley & Son; Museum of Modern Art  
**"Woman Combing Her Hair"** by Alexander Archipenko has geometric design made by radical departure from naturalism.

the living figure, the better the statue was as sculpture.

But some sculptors of this period possessed definite abilities. Most outstanding among them was Augustus Saint-Gaudens (1848-1907). Perhaps his most noteworthy monument is the quiet, grieving figure on the Adams monument in Washington. Daniel Chester French (1850-1931) designed the colossal figure of Lincoln in the Lincoln Memorial at Washington, D.C. Other representative sculptors were Paul Bartlett (1865-1925), George Grey Barnard (1863-1938), Gutzon Borglum (1871-1941), Henry Augustus Lukeman (1871-1935), and Lorado Taft (1860-1936).

**Sculpture of Today.** Modern sculptors have experimented widely with new forms, compositions, and materials. Among their achievements are some interesting applications of sculpture decorations to architecture. Examples include the reliefs of Lee Laurie on the Nebraska State Capitol and those of Alfeo Faggi on the Church of Saint Thomas the Apostle in Chicago.

Some sculptors, especially among the Europeans, have experimented with highly abstract forms which resemble nothing found in nature. Constantin Brancusi, a French sculptor born in Rumania, has simplified forms to the most elemental shapes. One of his sculptures represents little more than one large marble egg and one small marble egg lying side by side on a purple velvet cushion. He calls this work "Mother and Child." His famous sculpture, "Bird in Flight," suggests movement without attempting to resemble a bird in any way. He also contrasts one material with another, as many modern sculptors do.

Alexander Archipenko bases his abstract sculptures on the human figure. But he selects only those parts of the figure which he wants to emphasize in his composition. One of his more extreme experiments has been sculptures with moving parts run by hidden electric motors. He calls these works *Archipenturas*.

Perhaps a more interesting use of movement occurs in the sculptures of Alexander Calder, an American. He simply suspends shapes made of wire and sheets of metal in the air. These are linked together and balanced so that they will move and form a related composition when they are pushed by air currents. He calls these works *mobiles*.

Other abstract sculptors of note include Jacques Lipschitz, Amedeo Modigliani, and Oswald Herzog.

Some modern sculptors base their figures on natural forms, but with original interpretations. Aristide Maillol was the leader in France. His simple, powerful, nude female figures achieve some of the balance between space and mass which is found in Greek sculpture of the 400's. B.C.

Ivan Mestrovic is a native of Yugoslavia, who has also worked in Paris. His works combine surface pattern with bold, solid forms. His most important work is the sculptured decoration on the Racic Memorial chapel at Cavtat, Yugoslavia.

Carl Milles, the great Swedish sculptor, came to America to direct the Cranbrook Academy near Detroit, Mich. His "Fountain of the Tritons," at his home near Stockholm, Sweden, serves as an example of his skillful combination of sculptured forms with moving water.

Modern American sculptors have produced some outstanding work. The best-known American sculptors include Jo Davidson and Paul Manship, who spent much of their careers in Europe. Jo Davidson is famous chiefly for his fine portrait sculpture. Paul Manship is probably best known for his "Prometheus Fountain" in the sunken plaza at Rockefeller Center, New York City.

Mahonri Young has created interesting, realistic figures, including studies of various American sports.

Gaston Lachaise experimented with form and material. His bronze "Figure of a Woman" in the Museum of Modern Art, New York City, is a good example of his work.

The solid, weighty figures of William Zorach retain the feeling of the stone from which they are carved. One of his finest works is the marble "Mother and Child." Robert Laurent works with many kinds of material. A lovely torso figure called the "Pearl" is cast in aluminum.

The works of Jacob Epstein, an American sculptor who moved to England, have caused considerable controversy. But his portrait figures are bold and powerful.

Malvina Hoffman combines scientific accuracy of form with a quality of aliveness. Her most outstanding work is the representation of the races of mankind in the Chicago Natural History Museum.

L.R.

**Related Subjects.** The reader is referred to the list of Sculptors in the BIOGRAPHY section of the READING AND STUDY GUIDE, and to the following articles:

Bust	Design	Soap Sculpture
Carving	Relief	Wood Carving
Cast		

#### FAMOUS SCULPTURES

Elgin Marbles	Statuary Hall
Farnese Bull	Stone Mountain
Hermes of Praxiteles	Venus de Milo
Liberty, Statue of	Winged Bull
Mount Rushmore Memorial	Winged Lion
Palladium	Winged Victory
Sphinx	

#### Books for Younger Readers

BARSTOW, CHARLES LESTER. *Famous Sculpture*. rev. ed. Century, 1932. Master sculptors and their best-known works introduced to young people.

BRYANT, LORINDA MUNSON. *Children's Book of Celebrated Sculpture*. Appleton-Century, 1923. Fifty reproductions of well-known pieces of sculpture with information about the work and sculptor.

FOWLER, HAROLD NORTH, and FOWLER, M. Z. *Picture Book of Sculpture*. Macmillan, 1929. Story of sculpture told in illustration and text.

ROGERS, FRANCES. *Big Miss Liberty*. Stokes, 1938. The Statue of Liberty's story, from the time the idea came to the sculptor to the day it was unveiled.

#### Books for Older Readers

HOFFMAN, MALVINA. *Heads and Tales*. Garden City, 1943. The odyssey of this sculptor who traveled to all parts of the world for the material which makes up the collection in the Hall of Man at the Chicago Natural History Museum. *Sculpture Inside and Out*. Norton, 1939. Materials and processes of the sculptor, the knowledge he must have and the methods he must use.

ROTHSCHILD, LINCOLN. *Sculpture through the Ages*. McGraw, 1942. From the Egyptians to the present, with a chapter on African primitives. Each plate has a page of historical description.

TAFT, LORADO. *History of American Sculpture*. Macmillan, 1931.

VALENTINER, WILHELM REINHOLD. *Origins of Modern*

*Sculpture*. Wittenborn, 1946. Well-illustrated scholarly attempt to find a basic reason behind sculpture, from ancient to modern. See also **ART AND THE ARTS** (Bibliography).

#### Questions

How is sculpture different from painting?

Does the sculptor usually try to make exact copies of his model?

What is meant by: (a) sculpture in the round? (b) relief sculpture? (c) intaglio? (d) pictorial relief?

Why do some religions object to all sculpture?

How may sculptures vary in size? What is meant by sculptures on a *heroic scale*? On a *colossal scale*?

How is carving different from modeling? From casting?

What is an armature? How and why is it used?

How do sculptors harden clay figures?

How is a *mold* made?

What were the chief subjects of early Egyptian carvings?

What was the chief contribution of the Greeks to sculpture?

For what works is each of these sculptors famous: (a) Phidias? (b) Polycletus? (c) Praxiteles?

In what type of sculpture did the Romans excel?

Who designed the figure of Lincoln in the Lincoln Memorial in Washington, D.C.?

**SCURVY** is a disease caused by lack of vitamin C, or ascorbic acid, in the diet. Foods especially rich in this vitamin are citrus fruits, tomatoes (raw or cooked), raw cabbage and lettuce, celery and onions, cress, fresh carrots, and potatoes. These foods must be fresh from the garden to be useful in supplying vitamin C.

When vitamin C is lacking, important changes occur in the blood. These changes bring tenderness and swelling of the joints, a tired feeling, and anemia. The organs of the body can not act as they should. The effects on the mouth are special signs of scurvy. The gums become swollen and spongy, they bleed easily, and the teeth may loosen and fall out.

Foods that contain vitamin C prevent scurvy, and will also cure it, in most instances. Sanitary habits are also important. Treatment may include the use of antiseptic mouth lotions and blood tonics.

Scurvy used to be very common on ships during long voyages. The sailors lived on salt beef and hard tack for weeks at a time. The Portuguese navigator Vasco da Gama once lost 100 out of 160 men from scurvy. In 1795 the British navy first received a daily ration of lime juice to prevent the disease. Since then, British sailors have been called "limeys".

Modern research on diet has made scurvy rare. It is now common only in prison camps during wartime, and among the poor. But scurvy of babies, due to wrong feeding, may occur among rich or poor.

Scurvy of infants is called *Barlow's disease*. It is likely to attack a child after it has stopped feeding at its mother's breast. Infants learning to drink from a cup should be given orange or tomato juice regularly. Babies who are being fed by bottle should get juices after the first month. Ascorbic-acid tablets also may be given to prevent scurvy. J.L.L.

**SCUTARI**. See **ALBANIA** (Cities).

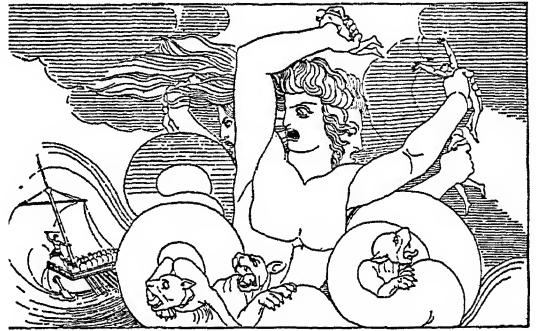
**SCUTCHER** and **SCUTCHING**. See **COTTON** (Manufacturing); **FLAX** (Flax Growing and Production).

**SCYLLA**, *SIL ah*, was a beautiful nymph in Greek

mythology. The sea-god Glaucus fell in love with her. Circe became jealous and changed Scylla into a frightful sea monster with six dog's heads and a serpent's body.

After that Scylla lived in a cave high on an Italian hill above the Strait of Messina. She reached out her arms and heads to seize men and animals that passed, and to attack ships. Another monster lived opposite her. Its name was Charybdis, and it constantly took water into its mouth and cast it out again. This made a dangerous whirlpool in the sea from which few ships could escape.

Homer tells that Scylla stole six men from the ships



**The Angry Scylla Sweeps Helpless Sailors** from their ship with her mighty octopuslike arms. This drawing of the monster that terrorized seamen is by John Flaxman.

of Ulysses when they passed under her rock. It was hard to steer between Scylla and Charybdis. This expression is used when a course between two evil things has to be taken. P.COL.

**SCYTHE**, *sith*, is a hand harvesting implement with a curved cutting blade having a long handle for the two hands, which distinguishes it from the *sickle*, which has a short handle for one hand. The cradle scythe used for mowing ripe grain is equipped with fingers or light rods which receive the grain and lay it in even *gavels* on the stubble. The long, bent wood handle of the scythe is called a *snath*. See also **REAPING MACHINE**. J.B.D.

**SCYTHIAN**, *SITH ih an*. The Scythians were a wandering people of Asia and eastern Europe. They lived on the treeless plains of ancient Russia, from the Danube River to the Volga. They were of Iranian (Persian) racial stock and spoke a language somewhat like ancient Persian, and distantly related to Russian. The Scythians were herdsmen, and lived in wagons covered with skins. They were filthy in their habits and used water only for drinking.

About 650 B.C. the Scythians invaded Media, to the east, and occupied the country for ten years. Cyaxares, King of Media, finally got rid of the Scythians by getting all their chiefs drunk at a banquet, and then killing them. Most of the Scythians were later killed by another wandering Asiatic people called the Sarmatians. In later times the name *Scythian* was sometimes given to all the nomadic peoples who lived beyond the northern limits of Greek and Persian civilization. Many modern Russians are among their descendants. J.W.Sw.

See also **MEDIA**.



**SEA.** See OCEAN and the list of Related Subjects at the end of the article.

**SEA ANEMONE.** *ah NEM oh nee*, is a sea animal which received its name because it looks much like the flower called anemone. The sea anemones, with the jellyfishes and corals, are placed in the phylum *Coolenterata*, the third lowest major division in the animal kingdom. Sea anemones differ somewhat in size and form, but in general the body is cylindrical with fringes or tentacles about the mouth. The diameter varies from about one fourth inch, in the *Sagartia*, to more than three feet in the case of the giant sea anemone of the Great Barrier Reef. The bodies show varying hues of bright colors. The sea anemone is often called the sea flower, because of its appearance. These animals usually remain more or less fixed to rocks or other places of attachment, but they have the power of slowly moving along on the base of the body. They are found in tide pools and on piles of wharves in harbors, as well as in deep waters.

The sea anemone obtains its food by means of its tentacles. This food consists of a variety of small fishes and other sea animals. The tentacles are equipped with so-called stinging or nettle cells, which throw out barbed threads that paralyze the creatures they strike. The prey is then dragged into the mouth opening by the tentacles, and digested in a single body cavity. Some of the tentacles bear pigment spots that serve as organs of sight. Sea anemones reproduce by eggs, by division, and by budding. In the last case, the new animal grows out from the base of the parent's body. It finally breaks off and forms a new individual. R. W. M.

**Classification.** Sea anemones belong to the class *Actinozoa*. A common species is *Metridium marginatum*.

**SEA ANIMAL.** See CORAL; CRUSTACEAN; DUGONG; FISH; OCEAN (Life in the Ocean); SEA COW; SEAL; SPONGE; TURTLE; WALRUS; WHALE.

**SEA BASS.** See JEW FISH.

**SEA BEAR,** a name applied to the fur seal. See SEAL (Fur Seals).

**SEABEES.** This fighting and building unit of the United States Navy has won high praise for its fast and efficient construction work. The name Seabee is taken from the first letters of the official name, Construction Battalion. During World War II, the Seabees carved airfields from the jungles of New Guinea and Tarawa. A few months after the Seabees landed, they had built roads and sidewalks, giant Quonset huts two stories high, and sewage systems on islands in the Pacific and Mediterranean areas. The Seabees are trained to build and repair, and also to defend what they have built.

The Seabees started as an experimental group of ninety-one men in October, 1941. The battalion was first officially organized on December 28, 1941. In 1943 the group was made up of 262,000 men. Most of these men were experienced carpenters, bricklayers, and building engineers. Although first organized during the war when it became necessary to do construction work too close to the enemy to use civilian contract labor, as had been customary, the Seabees are being continued as a permanent part of the naval organization. R. COL.

**SEA BIRD.** See BIRD, and list of Oceanic Birds in the Related Subjects at the end of the article.

**SEA COW, or MANATEE.** The sea cow, or manatee, is a large water animal that looks somewhat like a seal. It belongs to the same order of mammals as the dugong. The sea cow is a native of the coasts of South America, the West Indies, and Africa. The sea cow lives in rivers and salty lagoons, where it browses on water plants. It often stands upright among them on the curve of its tail. The sea cow has been much hunted for its flesh and oil.

The sea cow grows from eight to thirteen feet long and has a grayish black skin. It is an awkward animal, with no hind legs. Its front legs are paddle-shaped. The sea cow has a rounded tail, while the dugong's tail is forked.

The sea cow's upper lip is divided in two parts. The halves close on weeds and water grasses like a pair of pliers. These lip flaps are covered with short stubby



Chicago Natural History Museum

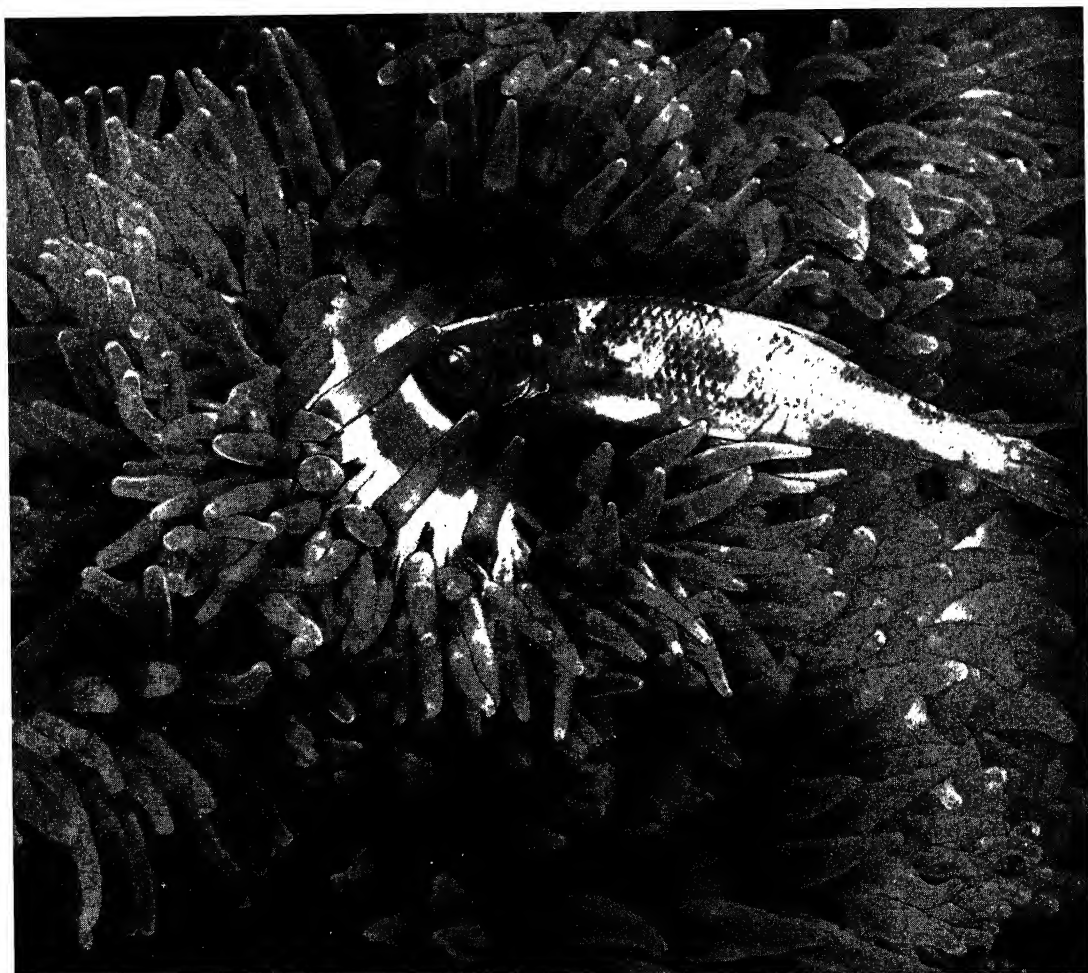
**The Florida Sea Cow** can perform the trick of standing partly out of the water, balanced on its broad tail. Although the front legs can be used as paws, the sea cow is helpless on land.

bristles. On a still night the noise of the sea cow's flapping lips and large crunching teeth can be heard 200 yards away. R. KEL.

See also DUGONG; SOUTH AMERICA (Animal Map).

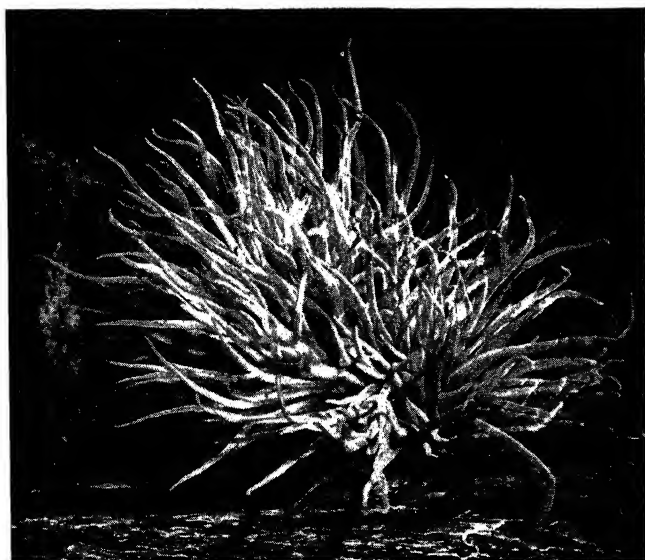
**Classification.** The sea cow belongs to the order *Sirenia*, the family *Trichechidae*. There are three species. *Trichechus manatus* lives in the southern United States, the Caribbean, and northeastern South America. *T. inunguis* lives in the Amazon Valley. *T. senegalensis* lives in West Africa.

**SEA CUCUMBER** is one of a class of marine animals related to sea urchins, sea lilies, and starfish. Sea cucumbers usually have long cylinder-shaped bodies, somewhat like the familiar garden cucumber. At one end of the body there is a mouth opening. Around it is a series of branching tentacles, usually ten in number. The animal expands and contracts these tentacles as it seizes its food. It has five double rows of tube feet, which can be extended and used for walking. There are



**The Sea Anemone Eating a Fish** which has been paralyzed by barbed threads shot from the anemone's tentacles. Now that

the fish is helpless, the anemone uses its tentacles to draw its prey slowly toward the small round mouth opening.



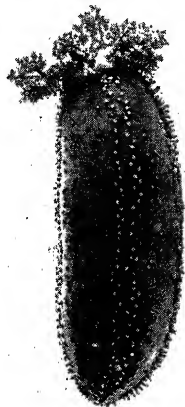
**The Tentacles of the Sea Anemone** are beautifully colored, but their touch



Photos: Dever, Croy, Unger, Black Star

**The Foot of the Sea Anemone** allows it

several hundred species of sea cucumbers found in all parts of the ocean. The ones that live in tropical waters sometimes grow to be two or three feet long. The sea cucumbers of temperate regions are from a few inches to a foot long. Many are caught in the East Indies, dried, and sent to Chinese food markets as *trepang*. One remarkable fact about sea cucumbers is that they can detach and throw out their intestines when another animal attacks them. These intestines hamper the movements of the attackers while the sea cucumber moves away. The sea cucumber then grows a new set of internal organs. See also ECHINODERM (with list); TREPANG.



American Museum of Natural History

The Sea Cucumber looks as if it came from a garden, instead of the ocean floor.

R.W.Mt.

**Classification.** Sea cucumbers make up the class *Holothuroidea* in the phylum *Echinodermata*.

**SEA DOG.** During the Elizabethan Age, English pirates and privateers who raided Spanish towns and shipping in America and near-by waters were called sea dogs. Their daring attacks threatened Spanish holdings in America and nearly drove the Spanish fleet from the seas. Today the term is applied to any experienced sailor.

**SEADROME** is a floating platform upon which airplanes can land. An aircraft carrier is a kind of seadrome, but the name is generally used for larger structures. Numerous models of seadromes have been made, and in World War II some of these plans were seriously considered by the United States Navy, but none was built. It has been proposed that seadromes be anchored in the mid-Atlantic to provide landing fields for passenger planes.

Late in 1945 the British Navy announced a floating seadrome made of many six-sided floats loosely bolted together. Each float was heavily braced by cross-members inside. Each float was like a large airtight can, six feet across the top, and formed a honeycomb pattern with the others. The drome rose and fell with the waves like a carpet of floating lily pads, but was rigid enough to support large planes. This type of seadrome, of any size, could be put together quickly and towed to any spot in the ocean.

R.F.Y.

**SEA ELEPHANT, or ELEPHANT SEAL.** See SEAL (Uses of Seals).

**SEA FOOD.** See CRUSTACEAN (Usefulness); FISH (Importance to Man); FOOD PRESERVATION (Canning Sea Foods); also names of shellfish, such as CRAB; LOBSTER; OYSTER.

**SEAGER, HENRY ROGERS** (1870-1930), was an American economist who was a noted authority on labor problems. He was born at Lansing, Mich., and studied at the universities of Michigan and Pennsylvania and at Johns Hopkins University. He was assistant professor

of political economy at the University of Pennsylvania, and later became professor of economics at Columbia University. Seager died in the Soviet Union, where he was making a study of the Soviet Five Year Plan. H.U.F.

**His Works** include *Introduction to Economics*; *History of the Shipbuilding Labor Adjustment Board*; and *Practical Problems in Economics*.

**SEA GULL,** any gull found on or near the sea. See GULL.

**SEA HORSE.** The sea horse is a small oddly-shaped fish that lives in the sea. It is so named because its head looks like that of a tiny horse. Another name for the sea horse is *hippocampus*, which comes from two Greek words meaning *horse* and *bent*, referring to the head bent into the shape of a horse's head. The sea horse is a relative of the pipefishes. There are numerous species living in tropical and temperate waters.

The sea horse has a long snout and prominent eyes. The body has a case of spiny, bony plates, like armor, that protects it from its enemies. The body is about six to ten inches long. It ends in a long tail, which can coil around objects. A tail of this kind is called *prehensile* and is used to cling to seaweeds.

The sea horse moves about in an upright position, weakly swimming with its dorsal fin.

The male sea horse takes care of the eggs laid by the



New York Zoological Society

**The Sea Horse** is the only fish which has a grasping tail. A knight, used in the game of chess, is modeled after the sea horse. The fish is so small that its head is sometimes preserved, fitted on a wood base, and used as a chessman.

female. He keeps them in a pouch on the underside of his body until they hatch.

L.P.Sc.

See also ANIMAL (illustration, Oddities of the Animal Kingdom).

**Classification.** The sea horse belongs to the family *Syngnathidae*. *Hippocampus hudsonius* is a species that lives along the Atlantic Coast of the United States.

**SEA-ISLAND COTTON.** See COTTON (Kinds of Cotton).



Chicago Natural History Museum

**SEAL.** The seal is a warm-blooded hairy animal which is fitted for life in the sea. The ancestors of the seals were land animals. In order for these animals to live successfully in the water, their feet and legs gradually changed into flippers. Water absorbs more heat from the body than air does, and so the seal developed a layer of tough spongy tissue filled with an oily fat just under its skin. This kept in the body heat.

The body of the seal is round and streamlined so that it slides through the water easily. The body is covered with oily hair. Some seals are very fast swimmers for short distances. Most of them swim on their backs a great deal. They can remain under water ten to thirty minutes.

**Kinds of Seals.** There are two distinct types of seals: the true seal, or hair seal (*Phocidae*) and the eared seals, which include sea lions and fur seals (*Otariidae*). The true seals have no outer ears, but only holes in the side of the head. Their flippers are usually short. The back ones extend straight back, palm to palm. These flippers are used for swimming with a back-and-forth movement, like a fish's tail. When out of water, seals move about by contracting their belly muscles. They look like huge, fat worms.

The sea lions and fur seals have small but distinct outer ears. Their flippers are comparatively long. The hind ones can be turned under and forward when on land. The eared seals can move quickly on land. They spring forward on their rear flippers and look like great clumsy rabbits. They swim by slow powerful thrusts of their front flippers.

The true seals are better fitted to life in the water than the eared seals are. True seals can live in the water indefinitely without coming ashore. Their young, called pups, sometimes are born in the water.

The eared seals, however, must have their young on land, as the pups can not swim at birth. True seals are very quiet animals. They may blow and snort, and some make low growling sounds. The eared seals, on the other hand, are very noisy, especially when they gather in great numbers on the rookeries during the breeding season. The bulls roar and bark, and the cows and pups howl and bleat. The uproar now and then dies down, and a cow can be heard suddenly howling for a lost

pup, or a pup will squawl vigorously for its mother.

All the seals have the same general shape, but they vary in size from the harbor seal, 6 feet long and 100 pounds in weight, to the great elephant seal, 16 feet long and 2½ tons in weight. The usual colors are grays and browns. Some kinds are spotted or have bands and rings of darker color. Only one or two kinds of seals live in warm subtropical waters. Most of them are found in temperate and polar seas. Several kinds of seals have their pups on the edge of the polar ice pack. These pups are pure white at birth, which makes them almost impossible to see. They gradually take on the colors of the adults when they can dive beneath the water long enough to escape their enemies.

**Fur Seals.** The fur seal is smaller than the sea lion. The principal difference between them is that the fur seal has short plushlike fur under its longer hair. When the skins are made into fur coats, the coarse outer hair is removed, and the shorter fur is retained.

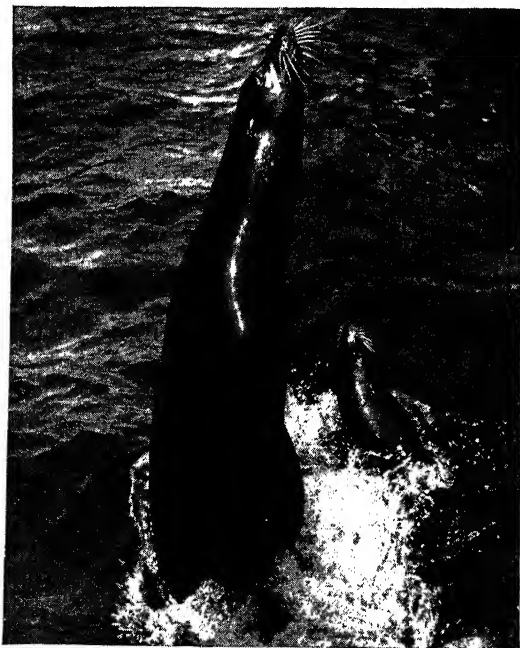
Because their fur is so valuable the fur seals have been studied and hunted by man since their discovery. They were killed on the rookeries, where they congregate during the summer to breed. They were followed during their migration and shot in the water. The largest herds of fur seals breed on the Pribilof Islands in the North Pacific. During the late spring the adult males, or herd bulls, arrive on the rookery and pick out a spot to their liking. As the cows arrive they are added to the harems of the bulls. Cow fur seals begin to breed when they are three years old. Some very active bulls will have harems of 60 to 70 cows. The pups are born a few days after the cows arrive, and several days later the cows are bred by their particular bull. The bulls remain on shore during the whole breeding season and do not eat for a period of several months. They are very thin at the end of the season. The cows swim out to sea and catch fish when they become hungry.

The fur-seal pup arrives in a noisy world that would give most young animals a nervous breakdown at an early age. Other pups sprawl and squawl. Cows continually move about snarling and making passes at each other. Ever so often, "father" decides that his neighbor or some prospecting outsider has designs on one of his wives and charges savagely to do battle. He roars through

his territory blowing and snorting defiance. Any pup that does not get out of the way with great promptness gets stepped on, usually with unfortunate consequences. If "mother" has been gone too long on a fishing trip and the hungry pup makes timid advances to a strange cow it will be picked up by the back and heaved away. If it lands on another cow in all probability it will receive another boost. When the pup is not involved in a noisy family fight, it sleeps and drinks lots of milk. After growing very fast for a few weeks it joins a group of its neighbors in paddling and splashing in the nearest tide pool, and so learns to swim. The swimming hole is usually not up to sanitary standards. The animals are very careless in their personal habits and the rookery is usually slippery underfoot and has a very gamy odor.

Along in October and November the animals begin to leave the rookery. They live in the water all during the winter, and slowly swim southward. Some go farther than others. The southern end of the migration is off middle California. Only a dead or crippled fur seal ever comes ashore during the migration. The herd remains 50 to 100 miles offshore. When spring returns the animals start north to the rookeries again where they will spend the summer.

The fur seals were hunted so persistently that there were fewer than 150,000 left when the United States signed a treaty with Russia, England, and Japan in 1911 and assumed control of the herds. In spite of the treaty it was necessary to guard the migrating herd with revenue cutters to stop the killing of the seals in the water. This was the most destructive form of seal hunting. The sealer who shot the animals in the water wanted only young bulls and cows. The hides of the larger bulls are always cut and scarred from fighting.

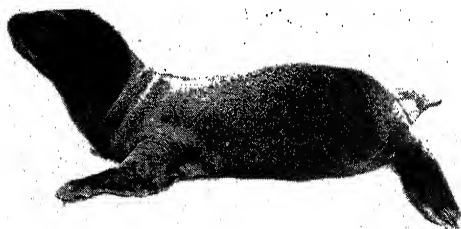


**A Sleek and Glistening Sea Lion** leaps from the water with a powerful movement of his strong flippers and tail.

Ylla, Guttlumette

The killing of every cow meant destruction of three fur seals, the cow, the year's pup, and the unborn pup. Many seals sank when they were shot in the water and were lost. Such sealing was a savage and destructive business.

Male and female fur-seal pups are born in equal numbers. One herd bull can mate with many cows, so there is always a surplus of young males. If too many ambitious young bulls are about, a great deal of fighting occurs. This is not desirable, as cows are killed and pups are stepped on. A bull is not sufficiently grown up to become a herd bull until he is about eight years old. The logical place to collect the crop of skins is from the surplus three-year-old bulls. The killing now is done by the local Eskimo under government supervision. The young bulls usually herd by themselves on the outskirts of the rookeries. It is an easy matter to drive them away from the rookery to the killing ground. There they are killed with clubs. Only a specified number are killed each year. Pelagic sealing, or killing seals in the water, is forbidden. Great care is taken to leave plenty of promising specimens as future herd bulls. The management of the



Fred H. Wylie

#### **A Day-old Sea Lion Looks Over His New World**

herd has been so successful that the herd has increased from 150,000 in 1910 to nearly 3,000,000 at the present time. The yearly harvest of skins is between 90,000 and 100,000. Unlike the meat of the sea lions, the fur seal meat is rank and inedible. The carcasses are turned into fertilizer. Some of the oil is used in the process of tanning the skins, and the rest is sold.

#### **Uses of Seals**

Before the white man came, and even today, the Eskimo depended on the seals as their chief means of obtaining food. From the seals they obtained meat, and oil for cooking, lighting, and heating. The skins were made into cloths and tents. The sinews were used for sewing. Spear and arrow points were made out of the seal's bones. In spite of their wide use, the Eskimo killed comparatively few seals.

In North Atlantic waters, seals are found in large enough numbers to support a modern commercial fishery. The principal kinds taken are the harp and hooded seals. For the last 150 years, fleets of seagoing boats have gone to the edge of the North Atlantic ice pack and collected sealskins. As many as 350,000 have been taken in a season. The skins of these seals are found to make a superior leather.

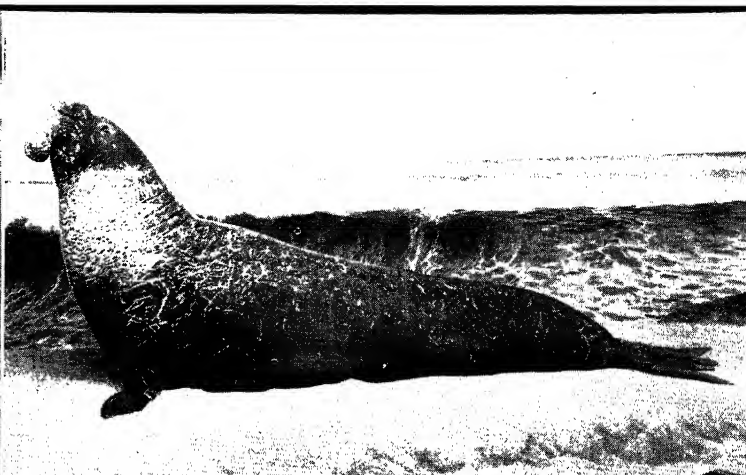
The only other true seal which has been widely used is the great elephant seal, which was killed for its oil.





Suschitzky, Pix

**The Tiny Ears of the Eared Seal** are clearly shown in this picture of the animal.



Chicago Natural History Museum

**The Elephant Seal** has a strange-looking snout that gives it its name. This huge seal—largest of the species—weighs more than two tons.

The elephant-seal hunters killed so many seals that the northern herds almost died out, and the southern herds were reduced to a few scattered remnants. There are several unusual features in the life history of the elephant seal. It is known that one thing they eat is the ratfish, which is never found in water less than 50 fathoms deep. The seals evidently go down to that depth to obtain them. The elephant seal's eyes are large, dark, and glowing. This also shows that they dive to great depths where the light is very dim. The sea elephant lands on sandy beaches during the summer to shed. Most animals shed a few hairs at a time, but the elephant seal sheds the whole outer layer of skin. It comes off in irregular patches and leaves the tender underlayer to harden by exposure to the air. The animals throw dry sand on themselves with their flippers during the shedding process. The sand eases the itching and drives away the flies which annoy the seals.

When they are shedding the seals do not like to go into the sea, as the salt water burns the exposed surfaces. They are sluggish, harmless animals. They were easily killed by the oil hunters, who merely walked up to them and thrust a three- or four-foot lance through their hearts.

The sea lions are the largest of the eared seals. They were once killed in great numbers for their oil and have been greatly reduced in numbers. The Eskimo in the North Pacific hunt them for food. The skins are used for roofing the summer houses, for boots and clothing, and to cover boats. The outer covering of the intestine is used to make waterproof "raincoats."

#### Seals in Captivity

The true seals, although docile and friendly in captivity, are not very intelligent. It is difficult to teach them very much. But the sea lions show considerable intelligence. Sea lions are graceful divers and swimmers, and natural jugglers. Wild sea lions will sometimes play with a piece of seaweed or driftwood, throwing it into the air, diving under and over it, and balancing it on their noses. The trained seals seen in zoos and circuses are nearly always California sea lion cubs. They can be trained to play simple tunes. The other sea lion cubs are too large for exhibition purposes and the bulls of all species are too large and fierce. Fur seals live only a short time in captivity.

#### The Seal Family (Pinnipedia)

##### Eared Seals (Otariidae)

*Northern Fur Seal (Callorhinus alascanus)*, North Pacific south to California and Japan. Bulls 6 ft., 500 lbs., cows 4 ft., 100 lbs. Nearly black, gray on sides.

*Southern Fur Seal (Arctocephalus australis)*, Cape Horn north to Brazil and Chile. Much like the northern fur seal.

*Steller's Sea Lion (Eumetopias stelleri)*, Alaska to Southern California. Bulls 12 ft., 2,000 lbs., cows 8 ft., 800 lbs. Light gray.

*California Sea Lion (Zalophus californianus)*, Middle California to Lower California. Bulls 6 ft., 1,000 lbs., cows 5 ft., 400 lbs. Light to dark brown.

*Southern Sea Lion (Otaria byronia)*, west coast of South America to Falklands. A smaller edition of the Steller's.

##### Hair Seals (Phocidae)

*Harbor Seal (Phoca vitulina)*, North Atlantic, North Pacific, and Arctic oceans. To 6 ft., 100 lbs. Yellowish gray spotted irregularly with dark brown.

*Ringed Seal (P. hispida)*, North Atlantic, North Pacific, Arctic oceans. To 6 ft., blackish brown.

*Harp Seal (P. groenlandica)*, North Atlantic, North Pacific, Arctic oceans. Bull 5½ ft., 400 lbs., cow 4 ft., 350 lbs. Yellowish white, head black.

*Ribbon Seal (P. fasciata)*, North Pacific and Bering



Union Pacific R.R.

**Eared Seals Sun Themselves** on top of a buoy at the entrance of the harbor at Catalina Island, near Los Angeles.

seas. Bull 6 ft., cow 5 ft. Dark brown, yellowish-white band around neck and around rear end, extending forward.

*Caspian Seal* (*P. caspia*), Caspian and Aral seas. Much like and a little larger than the ringed seal.

*Hooded Seal* (*Cystophora cristata*), North Atlantic and Arctic oceans. About the size of the harp seal. Grayish white with dark spots. Bull has a hollow crest or hood on front of head which is hollow and can be inflated with air.

*Monk Seal* (*Monachus monachus*), Mediterranean and Black seas. To 8 ft., dark brown.

*Leopard Seal* (*Ogmorhinus leptonyx*), South Seas, New Zealand. To 10 ft. Light gray mottled with brown.

*Weddel's Seal* (*Leptonychotes weddelli*), Patagonia, Antarctic seas. To 9 ft. Tawny, hair short and stiff. Very bulky in appearance.

*Northern Elephant Seal* (*Mironga austirostris*), Middle California to end of Lower California. Bull to 16 ft., 5,000 lbs., cows  $\frac{1}{2}$  smaller. Yellowish brown. Bulls have trunklike extension of nose which can be expanded.

*Southern Elephant Seal* (*M. leonina*), South Pacific, South Atlantic, Indian oceans. Much like the northern form.

P.Bo.

See also ANIMAL (color plate, Arctic Lands and Seas); BERING SEA CONTROVERSY; CIRCUS (color plate, Trained Seals Balancing Large Colored Balls); PRIBILOF ISLANDS.

#### Questions

How are seals especially fitted for life in the water?

What are the two chief types of seals? How are they different?

Where do fur seals spend the summer? The winter?

What are some of the noises that may be heard on a seal rookery?

Where do most seals live?

What color are most polar seal pups? Why is this a good thing?

How is the fur seal different from the sea lion?

Why are most seal furs taken from three-year-old bull seals?

What uses did the early Eskimo make of seals?

From where do most of the trained circus seals come? What kind of seals are they?

**SEAL.** A seal is a figure, lettering, or some other design that is pressed onto paper, metal, or wax. Seals are attached to important documents, usually along with signatures. Every country of the world has an official

sign, or *seal*. This seal must be placed on important state documents before they are considered official.

The designs, or inscriptions, of a seal are usually made in a special type of paper, called a *matrix*, or in a metal die, or in a gem. The matrix, die, or gem is pressed directly onto the paper or onto blobs of hot metal or wax on the paper. In olden times, kings and other government officials wore signet rings. These rings were flat at the top, and had a special design engraved on them. The design of the signet ring was pressed onto a blob of hot wax to make the seal.

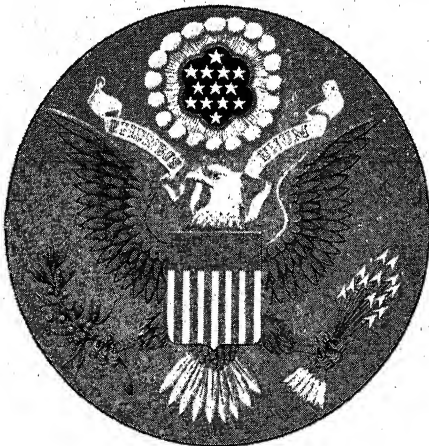
**Great Seal of the United States.** The official seal of any country is called its *Great Seal*. The Secretary of State has charge of the Great Seal of the United States. He must impress it on all important documents. Laws do not take effect until he has put the Great Seal on them. The present Great Seal is the second one that the country has had since independence was won in 1776. It was adopted by Congress in 1885.

On one side of the seal is an eagle. It holds a sheaf of arrows in the claws of one foot, and an olive branch in the other. In its beak is a ribbon which bears the Latin words *E Pluribus Unum*, meaning *from the many, one*. Above the eagle's head is a group of thirteen stars, and across its breast is a striped shield. The eagle stands for the United States Congress. The arrows stand for the Congress' power to make war, and the olive branch for the hope of peace. The stars represent the thirteen states which first made up the Union, and the shield — which is unsupported on the eagle's breast — shows that the country should depend on its own strength and virtues.

On the back of the seal is a pyramid, with an eye and the Latin words *Annuet Coeptis*, *it favors our undertaking*, above it. The pyramid is a symbol of the Union's lasting strength. The eye above it, and the words *Annuet Coeptis* refer to the many times Providence has come to the aid of the American people. The date (1776) in Roman numerals is at the bottom of the pyramid, and the words *Novus Ordo Seclorum*, which symbolize the beginning of a new age.

E.L.S.W.

See also BABYLONIA (Art and Architecture); SEALING WAX.



The Face and Reverse Side of the Great Seal of the United States of America

**SEA LAVENDER.** See FLOWER (color plate, Flowers of the Seaside).

**SEA LEVEL.** Sea level is the level of ocean waters. It is not the same in all parts of the world, and it changes with every tide. For purposes of measurement, a definite average of sea levels at various times has been agreed upon by scientists who must use sea level in their studies. Geographers use mean sea level as a starting point for measuring height or depth on earth. For example, Mount McKinley in Alaska is 20,300 feet *above* sea level. Death Valley, in California, is 276 feet *below* sea level.

W.E.E.

**SEA LILY, FEATHER STAR, or CRINOID, *KRI noid*,** is a member of a class of strange and lovely sea animals.

Some of these were very abundant in past ages, but now they are few in number. Some kinds of sea lilies are found in shallow water near coral reefs, either attached to them, or swimming about freely. A typical form has a cup-shaped head, or *calyx*, which contains the vital organs, and a jointed limestony stem. The featherlike arms which radiate about the head make the animal look like a flower, and are responsible for the name *sea lily*. The arms screen out tiny shellfish and particles of plant life from the water. This food is passed along grooves to the mouth. Some carboniferous limestones are almost entirely made up of the brittle stems of these animals.

R.W.Mr.

**Classification.** Crinoidea are classed with the *Echino-*  
*derms*.

**SEALING.** See MORMON (Church Doctrines).

**SEALING WAX** is used for sealing letters and documents and for taking the impression of seals. (See SEAL [a figure or lettering].) The wax may be made of rosin, shellac, turpentine, magnesia, chalk, or gypsum.

Before envelopes with gummed flaps were invented, sealing wax was usually used for sealing letters. But now it is seldom used for that purpose. That used for letters and documents is colored with vermilion, a red coloring matter, and is sold in the form of sticks. An inferior grade of sealing wax used for sealing packages is usually colored with lampblack. An inexpensive wax for sealing bottles and jars of preserved fruit is made by mixing nine parts of rosin with one part beeswax, and heating the mixture until it melts. If coloring matter is desired, lampblack or ocher may be used. The necks of the bottles should be dipped in the melted wax. Sealing wax is supposed to have been invented by the Chinese in the 600's.

G.R.G.



Rochester Museum of Arts and Sciences

**The Sea Lily Is Actually an Animal.** The graceful arms sweep food into its mouth, located at the top of the stem.

**SEA LION.** See SEAL; SOUTH AMERICA (Animal Map).

**SEALYHAM.** This dog is a type of terrier. It is fearless, with a powerful body and short legs. It was once bred to fight animals in their burrows. Its head looks somewhat like that of the Airedale, with powerful jaws. The sealyham is about ten or eleven inches high, and weighs around twenty pounds. Its coat is wiry and colored white, sometimes with brown or gray markings on the head. See also DOG (color plate, Terriers).

S.E.M., Jr.

**SEAM.** See SEWING (Simple Construction Processes).

**SEAMANSHIP.** The art of navigating a ship. See NAVIGATION.

**SEA MILKWORT** is a low fleshy plant which may have purplish or white flowers. See FLOWER (color plate, Flowers of the Seaside).

**SEANAD EIREANN, SAN and ER in.** See EIRE (Government).

**SEANCE,** say *AHNS*. See SPIRITUALIST.

**SEA NECKLACE.** See CONCH.

**SEA OF JAPAN, BATTLE OF.** See RUSSO-JAPANESE WAR (Last Battles).

**SEA ONION.** See SQUILL.

**SEA OTTER.** See ANIMAL (color plate, Arctic Lands and Seas).

**SEA PARROT.** See PUFFIN.

**SEA PERCH.** See FISH (Reproduction).

**SEA PIE.** See OYSTER CATCHER.

**SEA PIGEON.** See GUILLEMOT.

**SEAPLANE.** See AIRPLANE (Kinds of Airplanes).

**SEARCH, RIGHT OF.** See RIGHT OF SEARCH.

**SEARCHLIGHT.** A searchlight is a device which projects a beam of light. The light given off by the

source, usually electricity, is gathered by a concave reflector or by a lens into a beam, generally of nearly parallel rays. Modern headlamps in an automobile are small searchlights whose beams are produced by both a concave mirror and a glass lens. Beacons in lighthouses and along airways are searchlights specially designed for these purposes. Some searchlights used in war have concave mirrors sixty inches in diameter, which send out a beam of light approaching a billion candlepower. See also BEACON.

M.Lu.

**SEARCH WARRANT** is a paper issued by a court which permits an officer of the law to search a house or other building. It may be issued if there is proof that such illegal things as gambling implements, burglar tools, or counterfeiting machinery are hidden in violation of the law. In some cases, a search warrant may be issued to search for persons. In the Constitution, the Amendment to Article IV states that no unreasonable

searches or seizures may be made. The cause of search must be supported by oath. The warrant must describe the place to be searched, and the person or things to be seized.

Before 1760, search warrants in England and America were issued only for concealed stolen goods. In England, searches and seizure became such an issue, and were finally so restricted, that it led to the saying that "every Englishman's home is his castle." A.E.W.

**SEA ROBIN.** See FISH (Body of the Fish).

**SEA ROCKET.** See FLOWER (color plate, Flowers of the Seaside).

**SEA SALT.** See OCEAN (Water in the Ocean).

**SEA SCOUT.** See BOY SCOUTS OF AMERICA.

**SEA SHELLS.** See HOBBY (Books about Hobbies [Sea Shells and Sea Animals]).

**SEASHORE.** See OCEAN (Work of the Ocean).

**SEASICKNESS** is a disagreeable illness that comes from the pitching and rolling of a ship at sea. The symptoms are dizziness and headache, nausea, a sinking feeling in the stomach, and vomiting. In a severe attack the skin becomes pale, almost green, and damp, the pulse is feeble, and the person feels exhausted.

Doctors have given several different explanations of seasickness. The one most widely accepted says that the ailment is caused by disturbance in the semicircular canals of the inner ear. These canals give a person his sense of equilibrium. Some persons get the same kind of illness by the disturbance from swaying in a hammock or swing, or from traveling by airplane.

Some persons never get seasick, while others become ill from a slight motion. The reason for this difference has never been discovered.

Persons who easily become seasick can make the attacks less severe. During the week before a voyage, they should take care to keep their bowels active, and should eat simple but nourishing food. It is well to eat plenty of fresh fruit and vegetables and avoid heavy rich foods. Enough sleep and exercise in the open air every day will also help. A person who gets the attacks stands a better chance of avoiding them if he starts the voyage in good condition.

If the sea is rough, the person can help overcome his nausea by lying quietly in a steamer chair on deck, with his eyes closed. If he has a bad attack, it is best to stay in his berth, but the cabin should have good ventilation.

Seasick persons have different reactions to food and drink. Some feel better if they eat no solid food for a day or more. But if the attack continues a long time, the ship's doctor should take charge of the case, to see that the patient does not suffer a collapse.

Seasickness is never fatal unless it is so severe that it brings on some other sickness. If this happens, the patient should have medical advice.

Drugs such as hyoscine have been developed to prevent seasickness and treat victims of the disease, especially in the armed forces. Such drugs are effective with most persons. P.R.C.

**SEASON.** Changes of temperature and changes in the lengths of the days and nights divide the year into natural periods which we call seasons.

March, April, and May are the months of spring in

the northern part of the world. The summer months are June, July, and August. The autumn season includes September, October, and November. December, January, and February are the winter months. The seasons in the Southern Hemisphere are exactly opposite. Spring begins in September, summer in December, autumn in March, and winter in June.

Changes of season are caused by movement of the earth around the sun. The earth makes one complete revolution around the sun in the course of a year. The earth is always tipped at an angle of  $23\frac{1}{2}^{\circ}$  in relation to the path along which it moves.

Therefore the northern half of the earth receives more sunlight when the axis is tipped toward the sun, and less when the axis is tipped away from it.

The vertical rays of the sun reach the northernmost point on the earth's surface about June 21. This is called the *summer solstice*, and marks the beginning of summer in the Northern Hemisphere. It is the beginning of winter in the Southern Hemisphere. On December 22, the sun's vertical rays reach the southernmost point on the earth, and winter begins in the Northern Hemisphere. In the Southern Hemisphere, summer begins on this same date.

On about March 21, the sun is at its *vernal equinox*, or directly over the equator. Spring begins then in the Northern Hemisphere, and autumn begins in the Southern Hemisphere. The northern spring lasts from this time until June 21, the summer solstice. Summer lasts from June 21 until the *autumnal equinox* about September 23. Autumn extends from September 23 until the *winter solstice* on December 22. Winter lasts from the winter solstice to the vernal equinox.

These are the four astronomical seasons. The four seasons of our Temperate Zone occur at almost the same time, but seasonal changes elsewhere are not so clearly marked. The Torrid Zone generally has only a wet and a dry season. The polar regions also have only two seasons, a light season when we have our summer, and a dark season when we have our winter. W.E.E.

**Related Subjects.** The reader is also referred to:

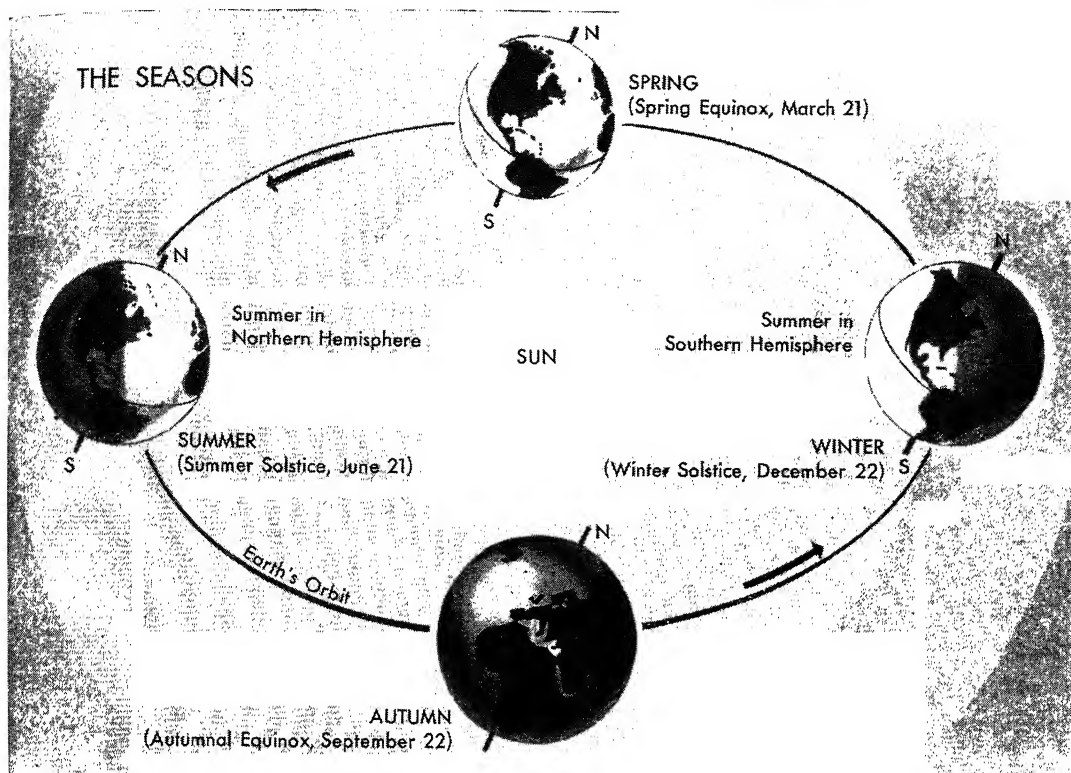
Autumn	Solstice	Summer
Equinox	Spring	Winter
Indian Summer		

**SEA SQUIRT** is a name for a group of sea animals which are also called ascidians. These animals have a



The Sea Squirt is also known as the sea potato.

habit of squirting out water through one of two body openings. Adult sea squirts have leathery bottle-shaped bodies. All their adult lives they remain attached to stones, shells, and other fixed objects. Some live together in colonies. The adult animal receives its food from water which it draws into the digestive tract through one of the body openings, the *mouth*. It squirts out the water from the other opening, the *atriopore*.



Sea squirts go through a larval stage before they become mature. The larva looks like the frog tadpole and can swim about freely. It has a notochord, or elastic rod, which extends through the tail. Because the larva has this rodlike "backbone," scientists think the sea squirts are relatives of the simplest fishlike animals, *lancelets* and *lampreys*. After a few days the larval sea squirt loses its tadpole shape and settles on the ocean floor. Soon it develops its adult form.

L.P.Sc.

**Classification.** Sea squirts are considered low forms of chordates. They belong to the class *Urochorda* and the order *Ascidacea*.

**SEA TROUT.** See **WEAKFISH**.

**SEATTLE**, Wash. (population 368,302), is the largest city of the Pacific Northwest. It is the third largest seaport of the Pacific Coast, and the port of the United States which is nearest to Alaska and the Orient. Seattle is the headquarters of the fishing industry of the northwest, including the rich Alaska salmon fisheries. The city is the trading and transportation center for a region rich in timber, metals, and fertile farmlands.

During World War II the population of Seattle was almost doubled when the city became an important center of naval shipbuilding and aircraft construction.

Seattle was named for a Duwanish Indian chief who was friendly to the early settlers during the 1850's.

#### Location, Size, and Description

Seattle lies on Elliott Bay, on the east shore of Puget Sound. It is about 900 miles north of San Francisco, and about 125 miles from the Pacific Ocean. The Canadian boundary is about 125 miles north of Seattle.

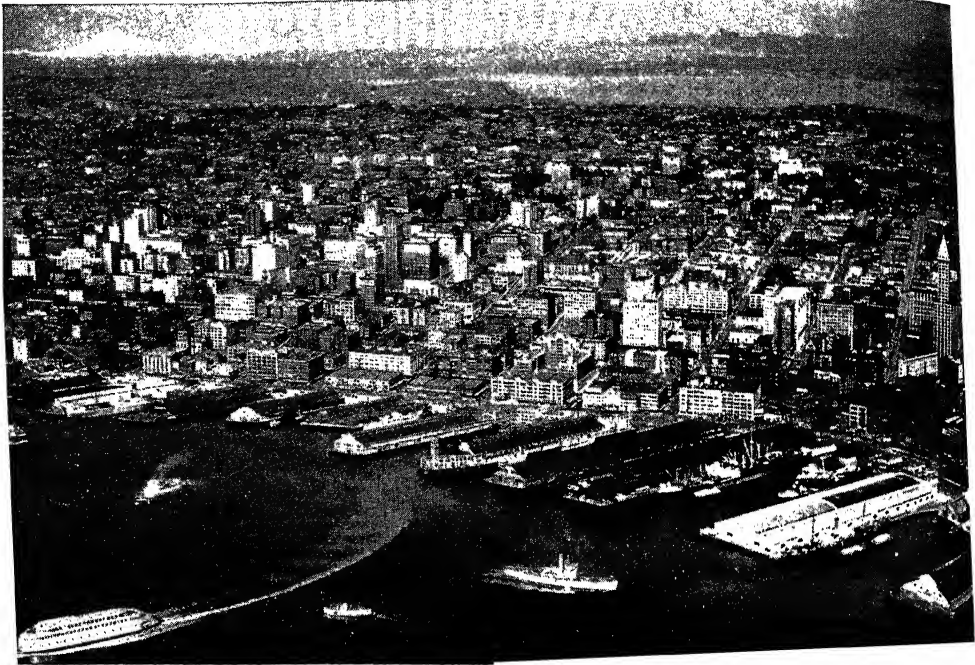
The city is built on seven hills that rise steeply from the shore of Puget Sound. East of Seattle is Lake Washington, a beautiful body of fresh water that is twenty-six miles long. The lake and the sound are connected by an eight-mile channel through Lake Union, the Ballard locks, and a ship canal. Lakes Washington and Union serve as a fresh-water extension of the Puget Sound water front. A United States Naval Air Station is located on Lake Washington, at Sandy Point.

Seattle is situated near a scenic wonderland of ever-green forests, clear lakes, and rugged, snow-capped mountains. The hills on which the city is built rise as high as 514 feet above sea level, and give a clear view of this scenery from most parts of the city. Across Puget Sound lie the Olympic Mountains. To the east rise the mountains of the Cascade Range, including Mount Rainier (14,400 feet), the third highest peak in the United States.

The area of Seattle is about seventy square miles. The central business district of the city extends northward from the water front for eighteen city blocks. The district covers five blocks on the higher but flatter ground to the north. The residential districts are located on the hillsides. These hills were at one time serious handicaps to the streetcar, bus, and automobile traffic. By using water with great pressure, however, sections of the hills were washed into the bay. This extended the shore line and created new ground covering about 1,400 acres for an industrial area. The height of some streets was cut as much as 130 feet by this land leveling operation.

The city is surrounded by residential and industrial





Seattle

**Seattle, Wash., the Gateway to Alaska,** is on the east shore of Puget Sound, 125 miles from the Pacific Ocean. The suburbs, including Port Angeles, site of the United States Coast Guard Air Station and Base.

#### Cultural Life

Seattle is the home of the University of Washington, which is the largest institution of higher learning in the Pacific Northwest. Colleges in the city include Seattle College, Seattle Pacific College, the Academy of the Holy Names, and the Cornish School of Music, Drama, and Dance.

The Seattle library system is made up of a large central library and ten branches. Excellent collections of paintings and other examples of the fine arts are maintained in the Seattle Art Museum and the Henry Art Gallery on the campus of the University of Washington. The city maintains a large civic auditorium.

**Parks and Playgrounds** cover 2,910 acres in Seattle. The largest parks are Denny, Lincoln, Volunteer, and Woodland. Many of the parks are located on hills and have been left in a natural state. The mild climate permits flowers and shrubbery to flourish the year round in Seattle, which adds greatly to the beauty of the parks. The city has twenty-four miles of scenic boulevard.

#### Industry and Trade

The port of Seattle is one of the best equipped in the United States, and in goods handled it ranks thirteenth among the ports of the nation. Seattle is a general cargo port, and exchanges goods with practically all of the ports of the world. It is served by 110 foreign and domestic steamship lines. The port facilities include wharves, transit sheds, cold-storage warehouses, grain elevators, and steam and electric freight-handling

equipment, all grouped to handle freight efficiently. row of fingerlike docks gives evidence of the city's increasing importance as a busy import-export center.

Seattle has about 1,500 industrial plants which normally employ about 42,000 workers. The city has progressed rapidly as a manufacturing center because the region near by is rich in water power, coal, lumber, and other raw materials. The products of Seattle industries include airplanes, flour, meat, lumber and wood products, furniture, steel, machine goods, transportation equipment, clay products, cement, clothing, and fishing supplies. Ships and small boats are built in shipyards along the Sound. The processing of canned and frozen fish is an important industry of the city. Fruits, vegetables, tea, coffee, and spices are also prepared for market in Seattle.

**Transportation.** Four transcontinental railroads enter Seattle through narrow valleys between the hills, and branch lines provide connections with the wharves of the water front. Automobile and truck traffic is carried across Lake Washington over a bridge of floating concrete pontoons a mile and a quarter long. There is regular steamship service to Alaska, and to Victoria and Vancouver, British Columbia, where connections can be made with Canadian railway systems. Frequent ferry service is provided to Bremerton, Wash., and other Puget Sound ports.

**Public Services.** Seattle is one of the leading cities of the United States in public ownership of utilities. The city produces its own water supply from the Cedar River. In 1902 the city began to produce electric power from a small generating plant, and in 1918 began construction of a power project on the Skagit River which now has a capacity of more than 85,500 kilowatts of electric power. Seattle also owns the city street railway

and bus systems, which were purchased from private industries at the end of World War I.

### History

The founders of Seattle landed at Alki Point in 1851. But this location was not suitable as a harbor for large vessels, and the settlers moved to the shores of Elliott Bay in 1852. Here a small group of houses and stores were clustered around a sawmill built by Henry Yesler in 1853.

The settlement developed rapidly, and Seattle was incorporated as a city in 1869. In 1875 regular steamship service was begun between Seattle and San Francisco, Calif. A short railroad connected Seattle with the Washington coal fields in 1877, and another was completed to the Puyallup Valley in 1883. In 1884 Seattle became a terminal of the Northern Pacific Railroad.

The Seattle business district was destroyed by fire in 1889, but was quickly rebuilt. In 1896 the first trans-Pacific steamship service reached the port of Seattle. More railroads entered the city, and Seattle expanded as a seaport and overland distributing center.

Seattle experienced its greatest rate of growth during the gold rush to Alaska that began in 1897. The city was the outfitting point for the thousands who went to Alaska in search of gold. In 1909 the Alaska-Yukon-Pacific Exposition was held in Seattle to display the natural resources of Alaska.

Steamship service between Seattle and Atlantic Ocean ports began in 1914 with the opening of the Panama Canal, and was followed soon after by trade with all the world.

Seattle experienced sharp growths in population and industries during World Wars I and II, when the city made valuable contributions to the war effort. O.W.F.

See also BRIDGE (illustration, Pontoon Bridges).

### Questions

Where did Seattle get its name?

For what industry is Seattle the headquarters?

Why did Seattle wash away some of its hills?

How does Seattle rank as a United States port?

What event in 1897 greatly increased the population of the city?

**SEATTLE COLLEGE** is a coeducational school in Seattle, Wash. It is controlled by the Catholic Church, but students of all faiths are admitted. Courses are offered in the liberal arts, sciences, education, engineering, and nursing. There is a graduate school. The college was founded in 1892 and has an average enrollment of about 1,300. H.O.S.

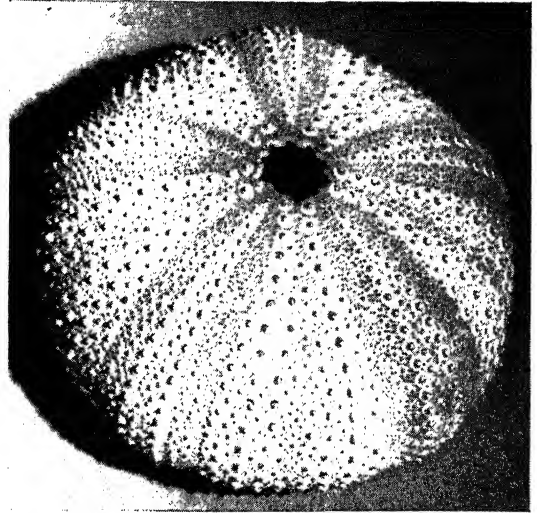
**SEATTLE NAVAL AIR STATION.** See SEATTLE.

**SEATTLE PACIFIC COLLEGE** is a coeducational school in Seattle, Wash. It is controlled by the Free Methodist Church, but students of all faiths are admitted. Courses are offered in the liberal arts and sciences. The college was founded in 1891 and has an average enrollment of about 350. C.H.WA.

**SEA TURTLE.** See TURTLE.

**SEA UNICORN.** See NARWHAL.

**SEA URCHIN** is an animal belonging to the same group as the starfishes, sea lilies, and sea cucumbers. Its body is covered with limestone plates imbedded in its skin. These plates bear hinged spines. "Without its spines," says one authority, "a sea urchin looks like an

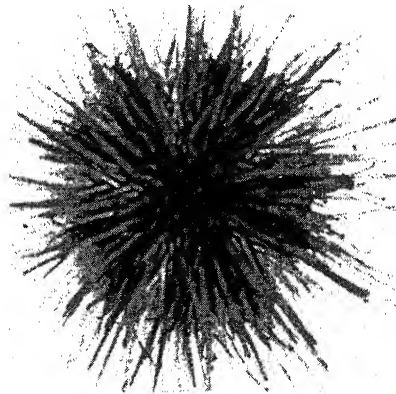


Lynwood M. Chace

**The Shell, or Skeleton, of the Sea Urchin** has the appearance of an ornamental pincushion. The shell is composed of stony plates, fused together to protect the soft parts of the body. Some sea urchins have flat shells and are called sand dollars.

old-fashioned door knob." On its lower surface, the sea urchin has a circular opening containing the complicated mouth parts. On the upper surface are the openings through which the eggs emerge. The animal thrusts out tube feet with sucking discs through tiny holes in the body covering. With these suckers it draws small animals into its large mouth. The mouth has five sharp teeth for grinding the food. The tube feet are used also as organs for getting about. Some of them are used as feeling tentacles. Sea urchins are found on rocky shores, in sand, and in deep water. A sea urchin of the California coast can burrow holes into solid rock. These animals all reproduce by eggs. Some kinds of sea urchins are sold as food. R.W.Mr.

**Classification.** Sea urchins make up the class *Echinoidea* in the major division *Echinodermata*. The edible sea urchins belong to the genus *Echinus*.



Ralph Buchsbaum

**The Sea Urchin** resembles a large-sized animated bur from some plant. The long, sharp spines are movable.



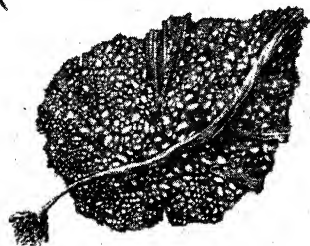
Red Algae from the coast of California



Beautiful Red Algae from New York harbor

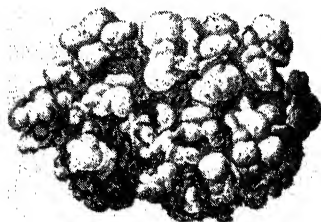


Sargassum, typical of algae in Sargasso Sea



Brown Algae from the coast of Massachusetts

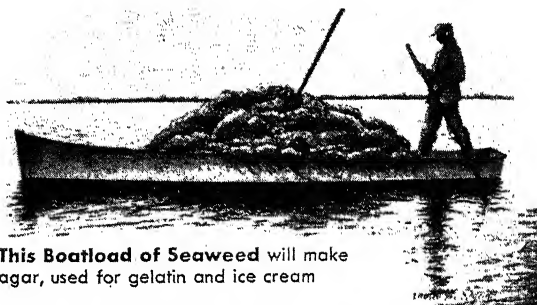
## SOME TYPES OF SEAWEED



Coral-like Red Algae from subtropical waters



The Brown Algae, Kelp, valuable as a fertilizer, grows to 100 feet



This Boatload of Seaweed will make agar, used for gelatin and ice cream

### SEA WALNUT. See JELLYFISH.

**SEA WATER, PURIFICATION OF**, is a method for making ocean water safe to drink. Sea water contains about one part in sixty-three of salts, mainly sodium chloride, sodium bromide, and magnesium bromide. This salt concentration in sea water is higher than the salt concentration in the human body. When a person takes a deep drink of sea water, the new salt content of his stomach soon begins to draw water from his blood. In a short time water has been taken from his body cells and he is thirstier than before. Sweating releases still more water and makes the suffering worse. Great physical pain often leads to insanity before death comes.

Now a substance called zeolite is made that will trap and hold the halogen ions of sodium and magnesium salts. This causes the chlorine and bromine to become hydrochloric and hydrobromic acid, and sets the sodium and magnesium metals free as carbonates. A man can drink a small amount of sodium and magnesium carbonate without harm. Life rafts during World War II were equipped with cannisters containing a sea-water zeolite. When a few cupfuls of sea water are filtered through this chemical, the fluid that comes forth is drinkable. By use of these devices the lives of

many ship-wrecked sailors and downed aviators were saved during World War II. Some ships have apparatus for distilling sea water for drinking purposes while on long voyages.

R.F.Y.

**SEAWEED.** Any plant that grows in the sea can be called a seaweed. But when a botanist speaks of seaweed he usually means one of the larger brown or red algae. These seaweeds are relatives of the green pond scums of stagnant water, but not of the higher water plants. The seaweeds of cold waters are chiefly brown algae. Those of the tropics are chiefly red algae.

On Columbus' first voyage to the New World his ships passed through masses of seaweed. These weeds were brown algae known as *gulfweeds*. One kind of gulfweed has small air bladders, shaped like berries, and it can float in the water. There is a large mass of these weeds floating in the Atlantic Ocean east of Florida. The area containing these weeds is called the Sargasso Sea.

Giant kelps of the Pacific are another type of brown algae. The "stems" of these giant weeds sometimes grow nearly two hundred feet long. During World War I, giant kelp were harvested to make fertilizers and explosives. They are one source of the chemical element iodine.

Irish moss is a seaweed that can be eaten. It belongs to the red algae. L.H.T.

See also AGAR-AGAR; ALGAE; IRISH MOSS; KELP; SARGASSO SEA; WATER PLANT.

**Classification.** Seaweeds are *thallophytes* of the division *Algae*. The giant kelp has the botanical name *Macrocystis pyrifera*. The gulfweed is *Sargassum bacciferum*.

**SEBACEOUS**, see *BA shus*, **GLAND**. See SKIN.

**SEBASTIAN**, see *BAS chan*, **SAINT** (died A.D. 288), was one of the early defenders of the Christian faith. He entered the Roman army without revealing his intent to assist and protect the Christians. The Emperor Diocletian liked him and made him commander of soldiers at Milan. But Sebastian's religious faith was discovered, and he was condemned to death. A troop of soldiers tied him to a tree and shot him with arrows. They thought him dead and left him. He was cared for by a Christian woman named Irene. Sebastian again declared his faith after he recovered. The emperor then ordered him to be clubbed to death in the amphitheater, and he was buried in the catacombs. Saint Sebastian tied to the tree was a favorite subject of early Italian painters. His feast day is January 20. F.J.S.

**SEBASTOPOL**, see *BAHS toh pohl*, or **SEVASTOPOL**. See CRIMEA (Sevastopol).

**SEBORRHOEA**, *seb oh RE ah*. See DANDRUFF.

**SEC**. See SECURITIES AND EXCHANGE COMMISSION.

**SECESSION**. See NULLIFICATION; WAR BETWEEN THE STATES.

**SECOND**. See MINUTE.

**SECONDARY EDUCATION**. See EDUCATION (Educational System).

**SECOND CONTINENTAL CONGRESS**. See CONTINENTAL CONGRESS.

**SECOND EMPIRE**. See FRANCE (History [Reaction and New Discontent]).

**SECOND REPUBLIC**. See FRANCE (History [Reaction and New Discontent]).

**SECOND SIGHT**. See CLAIRVOYANCE.

**SECOND, SEE kawrd**, **LAURA** (1775-1868), was a Canadian heroine of the War of 1812. Popular legend made her deed appear much more important than it actually was, but at the time her heroism did much to hearten the Canadian people.

Laura Secord was born in Massachusetts, but her parents took her to Canada shortly after the Revolutionary War broke out because they sided with the British. Later she married a sergeant in the militia and settled in Queenston, Ontario. During the War of 1812, United States troops occupied the town, and some soldiers lived in her house.

According to the story, one day in 1813 during the Niagara River campaign, Laura Secord overheard the Americans planning a surprise attack on the British

soldiers at Beaver Dam. As soon as she heard the plan she started walking toward Beaver Dam, driving a cow ahead of her as a reason for being out. The story says that she passed through the American lines and walked through the woods for twenty miles to warn the fifty British troops and 500 Mohawk Indians at Beaver Dam. Her warning, it was said, allowed the British to place themselves so that their fire made the Americans think they were surrounded by a large force and so surrendered.

Actually this story is full of errors. There was no cow, and Laura Secord walked at the most only about twelve miles. The Indians knew all about the American plans long before she arrived, and the skirmish was well under way before she reached the British commander. E.R.A.

**SECRETARY BIRD**. This large African bird looks like a hawk. Its name comes from the tufts of narrow feathers standing out from the sides and back of its head. They make the bird look like a secretary or clerk, with quill pens behind his ears.

The secretary bird lives on land. It makes its home in Africa, from Senegambia and the Egyptian Sudan south to the Cape of Good Hope Province. The bird is about four feet high and has very long legs and tail. It usually prefers to run instead of fly. It builds a bulky nest in a tree or bush, and lays two or three eggs at a time. They are dull white, spotted with rust. The secretary bird eats frogs, insects, lizards, small tortoises, and snakes. It may kill a snake by striking it with the wings or feet. Sometimes it flies with its victim high in the air and kills it by



Laura Secord, Canadian heroine of the War of 1812



New York Zoological Park

The Secretary Bird has a series of long narrow feathers extending from the back of its head, like the old quill pens that a secretary, or clerk, might place behind his ear.

dropping it to the ground. Then it lands and eats it.

In the Cape of Good Hope Province, secretary birds destroy many snakes, and there is a fine for killing the birds. South African farmers sometimes tame secretary birds and keep them around their buildings to kill rats and other pests. But unless the birds are well fed, they are likely to eat the poultry.

O.S.P., Jr.

**Classification.** The secretary bird belongs to the order *Falconiformes*. It is the only member of the family *Sagittariidae*. Its scientific name is *Sagittarius serpentarius*.

**SECRETARY OF STATE.** See CABINET.

**SECRETION**, see *KRE shun*. A secretion is a substance which body cells form from the blood. Saliva, tears, mucus, sweat, and insulin are all secretions. The making of these substances is called the *process of secretion*. The cells which form a secretion are often grouped together into a gland. A duct from the gland may then pour the product into some other part of the body. Some of the most important glands, the endocrines, have no ducts, but return their secretions back to the blood. These secretions are called the *hormones*. They are important regulators of growth and health. An *excretion* is the discharge of waste material from the cells.

A.C.I.

**Related Subjects.** The reader is also referred to:

Gland	Mucus	Saliva
Hormone	Perspiration	Tears
Insulin		

**SECRET SERVICE.** Frederick the Great of Prussia founded the modern secret service. He boasted that he had "more spies than cooks." Before the Prussians invaded Austria in 1862, they sent secret agents disguised as peddlers ahead of their army. These agents secured information about the land and the people which made the task of defeating the Austrians easier. All countries now use secret agents.

During World Wars I and II all nations made wide use of their secret service organizations. The German Gestapo and the NKVD of the Soviet Union (now the Ministry of State Security, or MGB), were most effective in World War II. The United States Secret Service was small, but it successfully exposed many plots against the Allies.

**The United States Secret Service** was organized by Allan Pinkerton early in the War between the States. This agency reported directly to President Lincoln as well as to the War Department. Its duty was to get information about disloyal persons in the North and in the war zones for use of the army. In the beginning the Secret Service was a small, loose organization which was disbanded at the end of the war.

The United States Secret Service was later reorganized as a division of the Treasury Department. It was first formed to detect and arrest counterfeiters of the currency. The Secret Service is thus one of the oldest government law-enforcing agencies.

After President McKinley was assassinated in 1901, the Secret Service was delegated by Congress to protect the President of the United States, members of his immediate family, and the President-elect. The bureau is headed by a chief in Washington. There are fifteen main offices of the Secret Service throughout the country, and thirty-five suboffices.

**The Office of Strategic Services** was formed during

World War II with Brigadier General William J. Donovan at its head. This agency was very effective in secretly getting important information about the enemy. It was semimilitary and used many experts in the languages, habits, education, commerce, industry, and geography of enemy and occupied lands. O.S.S. men were called "The Cloak and Dagger Boys."

**Other United States Agencies** which were very effective in secret service work during the war include the Federal Bureau of Investigation, the Military Intelligence Division of the Army, and the Office of Naval Intelligence.

K.D.

See also PINKERTON, ALLAN; SPY.

**SECRET SOCIETY.** An organization with secret oaths, membership, or initiation ceremonies is called a *secret society*. Some secret societies are social clubs, organized for the entertainment or benefit of their members. Many secret societies, such as the Masonic Order and the Benevolent and Protective Order of Elks, do much charitable and civic improvement work.

Some secret societies are organized to secure political power and to exert secret pressure on individuals and governmental authorities. The Ku Klux Klan was founded with this intention. The Italian Mafia was a lawless secret society opposed to authority and government.

There are many secret societies in the United States, but almost all of them are of the social type. Children often organize a secret society with secret symbols and passwords.

A.G.

See also FRATERNAL SOCIETY; FRATERNITY; SORORITY.

**SECTION** (land). See PUBLIC LANDS (Ranges, Townships, and Sections).

**SECTIONALISM** is the adherence to one side of a dispute because that side favors the interests of a particular section of a country. It is sometimes called *regionalism*. In the United States, sectionalism became especially strong in the years before the War between the States when the South and the North were sharply divided on economic questions and on the issue of slavery.

**SECURITIES ACT, NATIONAL.** In 1933 Congress passed the National Securities Act to protect the public from the purchase of unsafe securities. The act requires a detailed registration statement from every corporation which plans to issue securities and offer them for sale in interstate commerce. These registration statements must be filed with the Securities and Exchange Commission before the securities are offered for sale. They must give complete details about the purpose and the financial backing of all new security issues. See also CORPORATION; SECURITIES AND EXCHANGE COMMISSION. R.D.P.

**SECURITIES AND EXCHANGE COMMISSION.** This commission was set up by the Securities Exchange Act of 1934 to administer the National Securities Act of 1933. The purpose of the commission is to protect the interests of people who invest their money in securities. The Securities and Exchange Commission keeps a careful watch over the practices of securities-issuing corporations. It looks for any abuses on the part of the corporations which would endanger the public's investment. The commission also keeps the public informed of interesting developments in the securities field. The commission has the power to hold hearings and hand



down decisions in securities matters. Decisions of the commission may be appealed to the United States Circuit Courts of Appeal. See also SECURITIES ACT, NATIONAL.

R.D.P.

**SECURITY COUNCIL.** See UNITED NATIONS (Organization).

**SEDALIA**, see *DA lih ah*, Mo. (population 20,428), is the trading center of a large farming region. Every year farmers bring hogs, cattle, sheep, and poultry to Sedalia for the Missouri State Fair. The city lies in the west-central part of the state, about 180 miles west of St. Louis and about 80 miles southeast of Kansas City.

Sedalia is an important railway center which ships corn, oats, wheat, and soybeans from near-by farms to all parts of the Middle West. The general shops of the Missouri Pacific Railroad and the car shops of the Missouri, Kansas, and Texas Railroad are located here, and employ more than 2,000 persons.

Factories in Sedalia make shoes, work clothing, beverages, butter and cheese, poultry products, and feed. R.S.C.

**SEDAN**, see *DAN*, **BATTLE OF**. See BATTLES, FIFTEEN DECISIVE; FRANCO-GERMAN WAR (Progress of the War).

**SEDATIVE**, *SED ah tiv*. A sedative is a drug or other remedy that "soothes" the body. Sedatives act on the central nervous system, and sometimes on some other parts of the body. For example, they may relieve pain by acting on the sensory nerves. Anesthetics, anodynes, narcotics, and hypnotics are different types of drugs with sedative effects.

Ice caps and cold compresses are effective sedatives for headache, and are soothing in fever. Bismuth is a stomach sedative. These are examples of local remedies which help a pain in one part of the body. General sedatives may bring drowsiness, or act on the body as a whole. For examples, barbiturates and bromides produce sleep by acting principally on the brain.

Sedatives do not always have the same effect. The same drug may soothe one part of the body and excite another: Small amounts of a drug may deaden pain, while large doses may be irritating. Many sedatives are habit-forming, and many are dangerous, especially when taken in quantity over long periods of time. Sedatives should never be used except when prescribed by a physician.

A.E.S.

See also ANALGESIC; ANESTHESIA; ANODYNE; NARCOTIC.

**SEDGE**, *sej*, is a large family of plants which are much like grass plants and are closely related to them. They grow in most parts of the world, usually in wet places. The sedges have stems that are often three-sided and almost always solid, while the stems of grasses are usually round and hollow.

The sheath, or covering, at the base of each leaf on a sedge plant is closed around the stem. In grasses, this sheath is almost always split open on one side.

Sedges reproduce by means of little spikelets which bear the tiny fruits. The underground tubers of some kinds of sedge can be eaten, and the fragrant roots are often used in making perfumes. "Grass" rugs and matting are often made from sedges.

F.TH.

See also BULRUSH; GRASS.

**Classification.** Sedges make up the family *Cyperaceae*. *Carex* is the name of the largest sedge genus.

**SEDGWICK, ANNE DOUGLAS** (1873-1935), was an American author who spent most of her life in Europe.

Her most popular novel, *The Little French Girl*, discussed the conflict between French and English thought and ideals.

Anne Sedgwick was born in Englewood, N.J., but went to France when she was nine years old. The study of painting in Paris developed her sense of color and an appreciation of natural beauty which helped her to write vivid descriptions. She exhibited a few paintings, but soon devoted



Brown Bros.

Anne Sedgwick wrote many interesting novels.

her time to writing. Her first important novel, *Tante*, was published in 1911.

L.C.W.

Her Works include *A Childhood in Brittany Eighty Years Ago*; *Dark Hester*; and *Philippa*.

**SEDIMENTARY ROCK** is made up of mineral matter that was carried along and then dropped by wind, water, or ice. *Clastic sediments* consist of rock fragments that may range in size from dust-size (mud) to boulders. When they become cemented into solid rock, pebbles form conglomerates, sands form sandstone, and mud forms clay and shale. *Chemical sediments* form from mineral matter that was dissolved in water and then forced out of solution when some of the water evaporated. Some limestones and deposits of rock salt were formed in this way. *Organic sediments* consist largely of the hard parts of animals and plants, such as deposits of fragments of shells and corals that eventually turn into limestone, or dead plant matter that becomes peat and eventually coal.

Most sediments are deposited in layers, or *strata*. A single layer is called a *bed*, or *stratum*.

W.H.B.

**Related Subjects.** The reader is also referred to:

Clay	Sandstone
Limestone	Shale
Nummulite	Stratified Rock

**SEDIMENTATION**, *SED ih men TA shun*. See GEOLOGY (Terms [Deposition]).

**SEDITION** is an act which stirs up discontent against established government authority. Many countries, including the United States, have tried at times to prevent sedition by law. But Americans value the right to criticize government officials and their actions, so that laws against sedition have never been popular in peacetime.

In time of war, statements which are likely to hinder the successful progress of the war are dealt with as sedition. Sedition in wartime is a step toward treason. The Espionage Act of 1917, enforced during World Wars I and II, provided punishment for seditious statements. During World War II, as in World War I, it was used against enemy agents who tried to undermine the war effort by stirring up disloyalty in the armed forces. H.CAL.

See also ALIEN AND SEDITION ACTS.

**SEDUM**, *SE dum*. See STONECROP.

**SEE** is another term for diocese. See DIOCESE.



Lynwood M. Chase; General Mills, Inc.; Rutherford Platt

**SEED.** Seeds are the most important part of a plant. The roots, the leaves, the flowers, all exist so there can be seeds. And because each seed has been given the form that is best suited to produce its own kind of plant, there is great variety in their shapes, sizes, and colors.

Some seeds are round. Others are egg-shaped, triangular, circular, long and slender, curved, or coiled like a snail. Some seeds have horns, others have tails, and many have wings. Some are smooth, others are ridged. The color of the skin of the seeds varies also. It may be red, purple, orange, or any gay or dull color, striped or spotted, black or white. Many seeds look like beetles or pebbles in shape and color. In this way they escape being eaten by seed-eating birds. The carrot seed is shaped like a hairy bug, the chickweed seed like a caterpillar, and the castor-oil seed resembles a shiny beetle.

The sizes of seeds vary almost as much as the different kinds of seeds. Tobacco seeds are so tiny that one pod may contain as many as forty thousand. Poppy seeds are only slightly larger. From those tiny particles they range up through almost every size to the large Brazil nut and white walnut.

The size of the seed has no bearing on the size of the plant that will grow from it. The tallest tree in the world, the California redwood, grows from a very small seed. The large seed of a watermelon will produce only a low vine.

Some plants, such as ferns and mosses, do not have seeds. They reproduce their kind by means of spores. (See **SPORE**.) Many plants which bear seeds also have another method of reproduction. Onions, daffodils, and lilies develop bulbs from which new plants sprout. Strawberries have stems that creep along the ground. A new plant grows from each joint of the creeping stem. Lawn grass is thick because it has stems that creep underground, and new shoots sprout from the many joints. Potatoes have "eyes," and each eye is a plant bud.

Most plants, however, depend upon seeds alone to continue their kind.

#### How Seeds Develop

The part of a flower which contains the tiny seed-eggs is the ovary. To develop into healthy seeds the eggs must receive pollen from the same flower or the same kind of flower. Many changes then take place, and continue while the seed is developing.

**Kinds of Seeds.** All seeds are either *gymnosperms*, which are naked seeds (not enclosed in an ovary), or *angiosperms*, enveloped seeds (enclosed in an ovary which ripens as a pod or fleshy fruit). Naked seeds are like those of the pine and all other cone-bearing trees, and

of certain ternlike plants of the tropics. The seeds of all plants—trees, shrubs, and herbs—that bear flowers are angiosperms.

Angiosperms that ripen in a dry seed pod are called dry fruits. When the seeds are surrounded by pulp, as in apples, peaches, tomatoes, and grapes, they are fleshy fruits. See **FRUIT**.

When a plant has seeds with only *one* cotyledon, or seed leaf, it is called a *monocotyledon*. Iris, tulips, lilies and corn are monocotyledons. Most plants have seed with *two* cotyledons, or seed leaves. They are called *dicotyledons*. Beans and peas, the oak, elm, and willow are dicotyledons. Nearly all cone-bearing trees, such as pine, spruce, and hemlock, are *polycotyledons*, because their seeds have *many* seed leaves.

**Parts.** The seed has three important parts—a protective outer skin, or *seed coat*; an *embryo*, which will become the new plant; and a food supply, or *endosperm*, usually in the form of one, two, or many *cotyledons*, or seed leaves. The cotyledons are stored with plant food—chiefly albumen and starch or oily matter. These nourish the embryo as it develops.

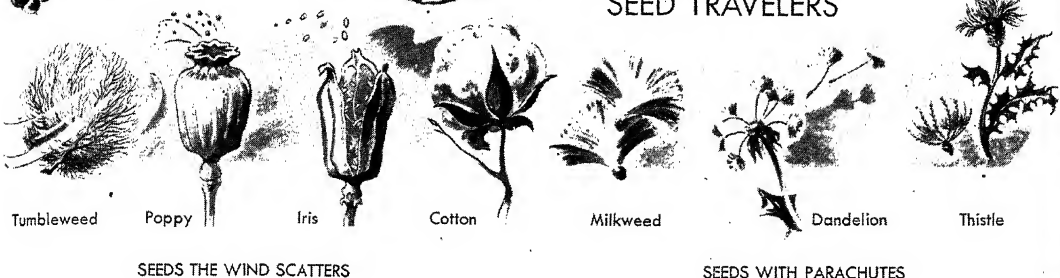
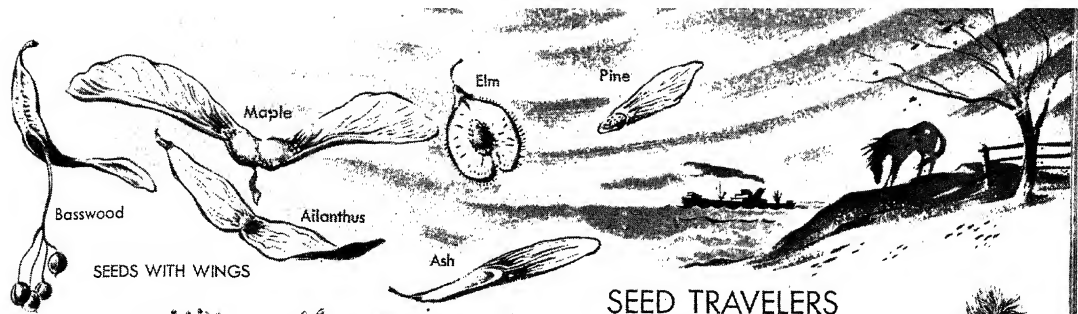
**Germination.** It is interesting to study a Lima bean that has been soaked in water. The two cotyledons, or the two halves of the bean, are attached to one end of the embryo stem, which holds the plant bud, or the growing point. At the other end is the tip that will become the root.

When a bean is planted it swells with moisture so that it bursts its seed coat. Then the embryo begins to grow. The root tip pushes through the eye of the bean. The embryo stem does not lengthen until it has rootlets to anchor it firmly in the earth. It then arches up through the earth crust, and brings up the delicate plant bud protected by the tough cotyledons. As the stem straightens, the cotyledons open wide, and the bud is exposed to the light and air it needs for growth.

In some seeds, as most beans, the cotyledons are raised well above the earth. In others they remain at the earth's surface. When the small plant no longer needs their protection and food they wither away.

In order to germinate, or sprout, a seed must have air, moisture, and the right temperature. Some seeds need a great deal of moisture, others only a little. Some will sprout in the cold ground of early spring. Others must have the sun-warmed ground of late spring or early summer.

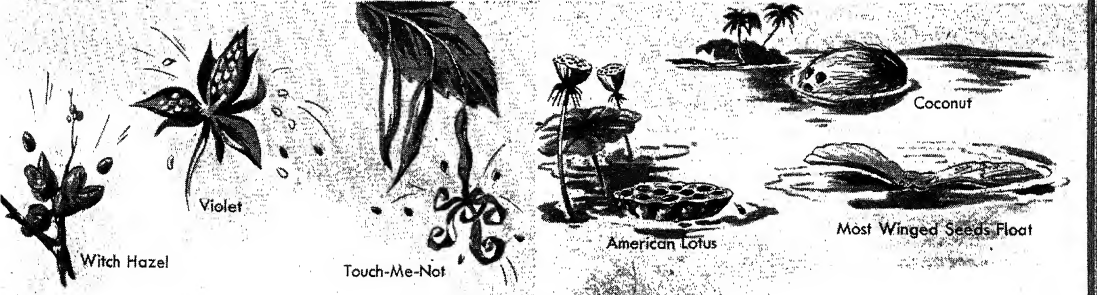
Nearly all seeds thrive best if they are planted less than a year after they have ripened. But most of them will keep for some time. Two-year-old corn germinates readily, but if corn is kept for three or four years its



WIND-BORNE SEEDS



SEEDS THAT HITCHHIKE



SEEDS THAT POP FROM PLANTS

SEEDS THAT TRAVEL BY WATER

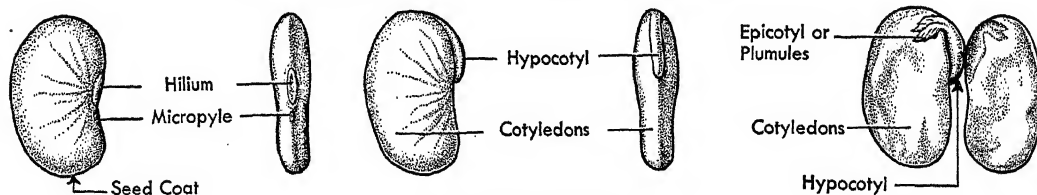
chances of sprouting are slight. A bean may sprout if it is eight years old, but usually a bean embryo dies after the third year. Cucumber seeds may be kept for as long as ten years. And wheat has germinated after thirty years.

Each state in the United States has its testing station to determine the vitality of seeds, their germinating possibilities, and their purity from weed seeds and other undesirable seeds. The large seed growers do their own testing before they package the seeds for sale. They discard those that are not up to their standard, and remove

wing is curved like a propeller blade. The wing helps the seed spin in the air, catch currents from all directions, and so travel farther. Ash and other trees have seeds with similar wings. The elm seed is in the center of a flat circular wing. It is so balanced that it keeps the wing surface to the wind, twirling like a weather vane. All winged seeds are heavier than downy seeds. They grow only on trees or high shrubs, for the wind is not strong enough nearer the ground to carry them very far.

Many seeds that depend on the wind to scatter them

## STRUCTURE OF A TYPICAL SEED: THE BEAN



**Outside of Bean**

**Outside of Bean  
with Coat Removed**

**Internal Structure**

all weed seeds. Gardeners and farmers have learned that if they plant only the very best seeds their crops will be larger, healthier, and of better quality.

### How Seeds Travel

Nature's work is not finished when seeds are ripened. They must have a chance to sprout and grow. If they fell straight to the ground, beneath the plant that bore them, they would be too crowded to thrive. A plant's seeds must be scattered, or dispersed. There are many ways in which this is done.

When the seeds of fleshy fruits are ripe, ready for planting, the skin of the fruit turns to a bright color, or even to black or white, to make it easy to see against the green leaves. Birds and other creatures are quickly attracted and eat the fruit. The seeds are not digested. They pass through the animal's body and are scattered in this way. Man helps by shipping fruits to distant points, or by eating them where they ripen and throwing the seeds away.

Fleshy fruits are bright-colored and attract birds. Dry fruits are dull in coloring, for they have very different methods of scattering their seeds. Most of them depend on the wind.

When a dandelion's blowball head is ripe, each seed has a long tail tipped with a parachute of fluffy hairs. The wind snatches the seeds off and carries them, held up by their parachutes, far away. When they spin to the earth, the seed, which is the heavier end, sinks a little if the ground is soft. The first rain may beat it in, or an animal may tramp it into the earth—and so it is planted.

Milkweed, cotton, kapok, and other seeds are covered with fluffy down to enable them to sail on the wind. The clematis seed trails a long feathery plume. A great many seeds have downy hairs which help them travel a long distance on the wind.

Other wind-borne seeds have delicate wings instead of down. The most familiar wings are probably those of maple seeds which grow in pairs. The pine seed's long

have neither wings nor down. They ripen in dry pods or capsules. A pod such as a bean or milkweed pod has only one cavity. A capsule is divided into two or more compartments, or carpels.

In a great many cases, the pod or capsule splits open when it is dry. The seeds do not fall out and down. They wait for the wind. In an iris capsule they are packed so firmly they can not dislodge themselves, but when the wind shakes the stalk they are thrown out in every direction. Mustard seeds cling to a flat middle partition until the wind sweeps them off and away. The carrot's slender capsule, which contains only two seeds, splits into two halves. Each half sails off on the wind, carrying a seed attached to it.

The columbine's tall capsule opens pitcherlike mouths at the top. The wind scoops off the upper seeds and whirls them far away. When it rattles the stalk the other seeds are widely scattered. The poppy's capsule has many tiny holes around the top. These have trap doors to keep the seeds from falling out. When the wind tosses the stalk back and forth the doors snap open and the seeds are sprinkled out in a fine, wind-blown spray.

There are other ways in which the wind is useful in scattering seeds. The tumbleweed of the Western plains rolls itself into a ball when the seeds are ripe, and its roots dry and shrink. The first wind uproots the entire plant and sends it rolling over the prairies, scattering seeds as it goes.

Dry fruits with seeds too heavy for the wind to scatter have other methods. Some "shoot" their seeds out, forcing them to hop far away by an elastic contraction of the inner wall of the pod. When a bean pod dries and splits into two halves, it whirls the beans out in many directions by twisting or curling. A violet capsule splits into three little boat-shaped sections. The sides of each little boat then squeeze together from the bottom upward until every seed has been shot out and away.

A familiar way for seeds to travel far from the parent plant is by means of hooks and barbs. These grasp and cling to the fur of passing animals. Burs, sticktight, and

Spanish needles are very well known for they cling to the clothes of people who brush against them.

Seeds growing near water may float far downstream or across a lake before they are cast ashore. Wading birds often carry seeds in the mud on their feet as they fly off. The sticky seeds of mistletoe cling to the bills of birds, and may be scraped off on a distant tree. Squirrels and chipmunks carry off nuts and bury them and do not always return for them—thus both scattering and planting them.

A great many of the seeds that are produced each year and are so well scattered never become plants. Many fall where conditions are not suitable for germination and growth. Many are eaten by birds and rodents. In many the embryo is not alive. Because of this tremendous loss of seeds, the plant produces a great number of them so that some will surely survive. One tobacco plant may ripen a million seeds. But when there is so enormous a quantity, the number of them that will sprout is very small. A coconut palm rarely produces more than a hundred seeds, often no more than twenty. Whenever there is a small number of seeds, their germinating percentage is high—very few can afford to be wasted.

#### Uses of Seeds

Seeds are of great importance to man. Their widest use is for food. Among all seed foods, cereals rank first. Rice is the most important. It is the chief food of millions of people in Asia and many in the Pacific Islands. Enormous quantities of wheat are consumed throughout the world. Corn feeds millions of people in the two Americas. Other important cereals are oats, barley, millet, buckwheat, and rye.

Edible fruits and nuts are seeds and seed coverings. Seed foods in the vegetable garden include beans, peas, tomatoes, eggplants, peppers, okra, cucumbers, squashes, pumpkins, and melons. Coffee, chocolate, and cocoa are beverages made from seeds. Vanilla flavoring comes from seeds. Mustard, black pepper, caraway, and nutmegs are other flavoring substances made from seeds.

Cotton is the fluffy down of seeds. Kapok is the down of similar seeds from a tree.

Even more important in industry are the oils extracted from seeds. Cottonseedoil, linseedoil, castoroil, sunfloweroil, soybeanoil, coconutoil, palmoil, are only a few of them. Seed oils have a multitude of uses. They are used for food as salad oils and cooking fats, and in making soaps and perfumery, linoleum, printer's ink, artists' colors, paints and varnishes, insecticides, and many other things. When the oil has been extracted from cotton seeds, sunflower seeds, and soybeans, the remaining pulp is used for cattle and poultry feed.

Seeds are widely used in making industrial alcohol, plastics, synthetic rubber, and in medicine. Probably the most valuable seed medicines are strychnine, belladonna, and castoroil.

V.Q.

**Related Subjects.** The reader is also referred to:

Angiosperm	Gardening (Planting
Cotyledon	Seeds)
Cross-Pollination	Germination
Flower (How Flowers Re-	Gymnosperm
produce; illustration,	
From Pollen to Seeds)	

#### Questions

What is the most important part of a plant? Why?

How many seeds vary in shape? In size and color?

Do all plants develop from seeds?

What is the difference between angiosperms and gymnosperms?

What are the three main parts of a seed?

Why should most seed be planted the year after it has ripened? After how many years may bean seeds sprout? Wheat seed?

What are some seeds that are especially suited to be carried by the wind?

Why is it important that most plants produce very many seeds?

What is the chief importance of seeds to man?

**SEEDEATER.** See FINCH.

**SEEDER.** See FARM MACHINERY (Kinds of Farm Machinery).

**SEGER, ALAN** (1888-1916), wrote one of the most memorable poems of World War I, "I Have a Rendezvous with Death." A feeling that he was going to die inspired him to write the poem one day just before he was to go "over the top" with his infantry company. On July 4, 1916, he was ordered with his company to clear the enemy from a village. In the first advance, he was wounded and died on the field.

Seeger was born in New York City, but spent part of his youth in Mexico City. At the beginning of World War I, he joined the French Foreign Legion. L.U.

**SEEING EYE.** The Seeing Eye is an organization near Morristown, N.J., where dogs are trained to guide blind people. Seeing Eye trainers teach the dogs to obey their owners, and to disobey any command which would be dangerous to carry out. These dogs learn to guide their masters around such overhanging obstacles as low



The Seeing Eye

**A Blind Student** goes confidently about his affairs with the aid of his perfectly trained Seeing Eye dog.



branches or awnings, under which the dog could walk but the master could not follow. The dogs help blind persons get about the streets safely. They learn to watch traffic, and cross streets only on the proper command. The dog is partly trained before the master arrives at the school to spend a month learning how to use the dog guide. Most of the Seeing Eye dogs are German Shepherds.

M. JOB.

**SEELAND**, or **ZEALAND**. See DENMARK (Location, Size, and Surface Features).

**SEERSUCKER** is a cotton or rayon material with crinkled stripes. The material is woven by holding a group of the longwise, or warp, yarns tight, while another group of the warp yarns is loose. The tension on the warp yarns alternates, the same group being slack at one crossing of the crosswise threads and loose at the next crossing. Seersucker is used to make dresses, children's clothes, and men's summer suits. It may be washed and worn without being ironed. Seersucker is made in widths of from 30 to 36 inches. See also **MERCERIZING**.

G.G.D.E.

**SEGO**, *SE goh* **LILY**. The sego lily is one of the mariposa tulips. It is the state flower of Utah. *Mariposa* is a Spanish word for butterfly, and the petals of the sego lily look like a butterfly's wings. They are white, tinted with yellowish-green or lilac, and have a spot of purple at the base. The sego lily is native from Washington to New Mexico, but can be grown in the northeastern states if it is protected from frost. The flower grows on a stem about a foot and a half tall, and the leaves are long and thin. The plant has a thick underground stem that looks like a bulb. The early Mormons in Utah cooked these underground stems, or corms, and ate them. A.C.H.O.

**Classification**. The sego lily belongs to the family *Liliaceae*. Its botanical name is *Calochortus nuttallii*.

**SEGOVIA**, *seh GO vyah*, or **WANKS RIVER**. See HONDURAS (The Land and Its Resources).

**SEIDL**, *ZI d'l*, **ANTON** (1850-1898), was an orchestra conductor. He was born in Budapest, Hungary. He assisted Richard Wagner at the first of the famous Bayreuth festivals in 1876. In 1885 he became conductor of German opera at the Metropolitan Opera House, New York City, and became an American citizen in 1891. From 1891 to 1898 he was conductor of the New York Philharmonic Society.

G.B.

**SEIDLITZ**, *SED litz*, **POWDERS** are used to prepare a gentle laxative drink. They are named for a Bohemian spring of carbonated water and contain Rochelle salts. Seidlitz powders are often put up in two packages, one blue, the other white. The blue paper contains a sodium and potassium tartrate with sodium bicarbonate. The white paper contains an acid tartrate. The powders are first dissolved separately in two half-tumblers of water. One solution is then poured into the other. The mixture begins to fizz, or effervesce, immediately, and should be drunk at once. Seidlitz powders give better results when taken on an empty stomach. They produce a gently relieving action of the bowels. See also **SALTS**; **SODA**. A.E.S.

**SEIGNORAGE**, *SEEN yer ij*. See **MONEY** (Free Coinage).

**SEINE**, *sayn*, **RIVER**. The statue of a nymph marks the spot where this famous French waterway rises eighteen miles northwest of Dijon. From here the Seine flows in a

winding course about 480 miles northwestward to its mouth in the English Channel near Le Havre. About 235 miles from its source it becomes the broad river which flows through the heart of Paris. In Paris its waters move under more than thirty bridges, some of which were built over three hundred years ago. On the left bank of the Seine in Paris are the Latin Quarter, the Sorbonne, and the Luxembourg Gardens. On its right bank are the Louvre, the Champs Elysées, and the Trocadero. The Cathedral of Notre Dame stands on an island in the Seine.

Small boats carry people and goods westward from Paris on the Seine past Saint Cloud, which is famous for its horse races, and past Saint Germain with its handsome palaces. The Seine then winds through the pleasant provinces of Normandy to Rouen, where sea-going ships are docked. Southeast of Paris, the Seine flows through Fontainebleau, past wheat fields, peach orchards and famous vineyards.

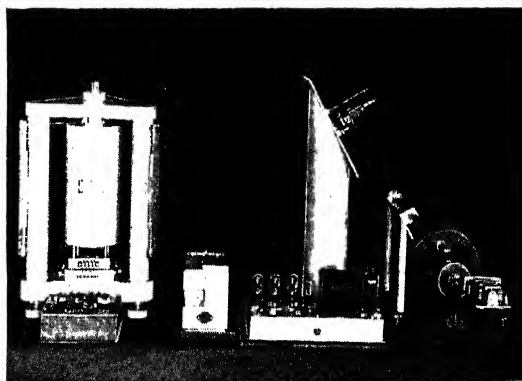
The Seine is important to commerce as well as being a beautiful, winding river. It is joined by the Aube, Marne, Yonne, and Oise rivers. Canals connect it with the Loire, Rhône, Rhine, Meuse, and Scheldt rivers. Boats can sail over 337 miles of its total length. The Seine has flooded its banks seven times. Much damage was caused when it rose more than twenty-four feet in a flood in 1910.

W.R.McC.

See also **BORE**.

**SEISMOGRAPH**, *SIZ moh graf*, is an instrument which tells when an earthquake takes place, where it is, and how strong it is. It is so accurate that a seismologist in Washington, D.C., often is able to name the island in the southwest Pacific on which an earthquake occurs.

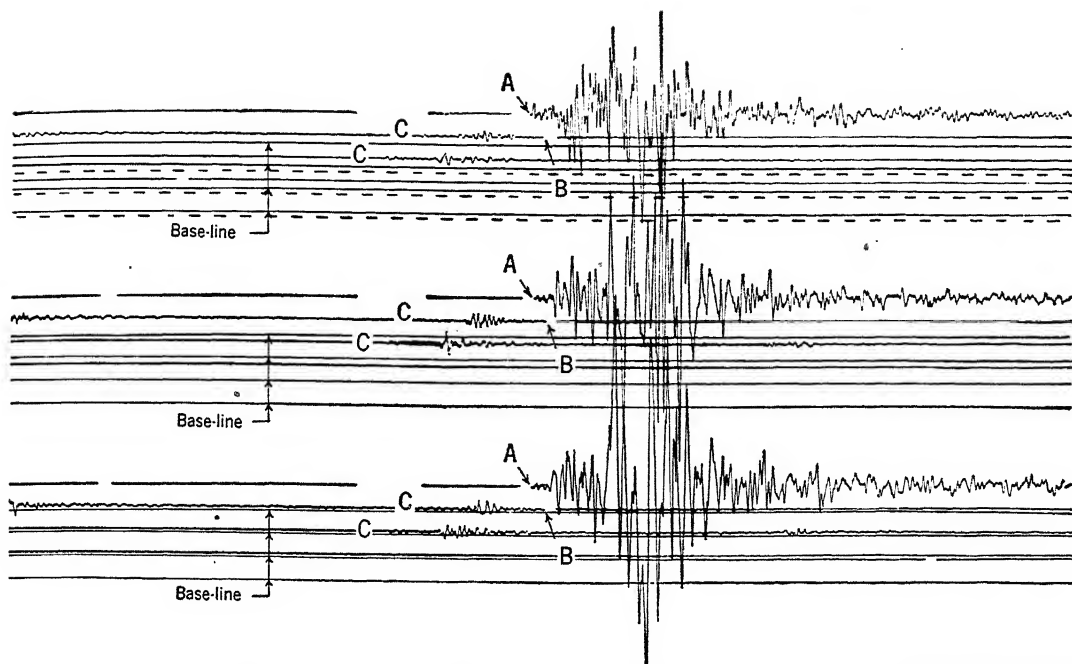
The most sensitive type is the Benioff seismograph. In this device a cylinder hangs from a frame by a deli-



Coast and Geodetic Survey

**The Benioff Seismograph** used to record earthquakes is so sensitive that it can even record traffic vibrations.

cate spring and remains stationary. Its frame moves whenever the earth's crust moves. In the cylinder is a magnet wound with coils of wire which are attached to a galvanometer. In case of earthquake, there is a change in relationship between the magnet and an iron bar fixed into the frame. The change creates an electric current which passes to the galvanometer. The current turns a mirror attached to the galvanometer. A light



**The Seismograph Recording of an Earthquake** which occurred at Helena, Mont. The three records show, from top to bottom, vertical, north-south, and east-west movement. "A"

marks the beginning of the quake and "B" marks the end of the run about one minute later. "C" marks the affectershocks. This record was made on photographic paper wound on a drum.

shines on this mirror. Its reflected beam moves and makes a record on a moving strip of photographic paper wound on a drum. This seismograph is so sensitive that it magnifies earth motion up to 100,000 times. It even records automobile traffic.

Other seismographs are used when less sensitive records are desired. The Galitzin seismograph, which works on the same principal as the Benioff, magnifies movement only 2,000 times. There are similar limitations in the case of the Milne-Shaw and the Wood-Anderson seismographs. The Wood-Anderson instrument uses mechanical rather than electrical means of measurement. It consists of a copper cylinder weighing only a fraction of an ounce, hung by a fine tungsten wire from a frame. A mirror is attached to the cylinder. During an earthquake, the cylinder twists and the mirror twists with it. The reflection of a light in the mirror moves back and forth on photographic paper, as with the other instruments.

There are about fifty seismograph observatories in the United States and its possessions. They are maintained by the Federal Government, through its Coast and Geodetic Survey, and by educational and scientific institutions.

N.H.H.

See also EARTHQUAKE; SEISMOLOGY.

**SEISMOLOGY**, size MAHL oh juh, is the science which studies earthquakes. The first scientific explanation of earthquakes was published in 1846 by Robert Mallet, an Englishman. He was the first to apply the law of wave motions to solids such as rocks and earth in explaining earthquakes. He discovered that earthquakes usually do not start at one point, but all along a certain line, and that many of them are only a few miles deep.

Modern seismology uses an instrument called a *seismograph* which records the arriving earthquake waves and so makes it possible to locate the earthquakes even if they are several hundred miles below the surface.

Seismologists have learned important facts about the damage earthquakes do, and how to avoid damage as far as possible. Engineers have learned to build buildings with a certain ability to resist shock. Seismology also has told us something about the earth itself. One type of wave, called *transverse*, which is always given off when a body is twisted, struck, or shattered, does not register on the seismograph, in the case of a very distant earthquake. Since these transverse waves do not travel through liquid, scientists have concluded that they are absorbed by the earth's core, and that therefore this core is liquid.

N.H.H.

See also EARTHQUAKE; SEISMOGRAPH.

**SELAH**, SE lah, is an ancient Hebrew word whose meaning has been lost, although it seems to be related to a word meaning *to lift up*. It occurs seventy-one times in the Book of Psalms and three times in the Book of Habakkuk, 3:3,9,13. Selah is supposed to mean a pause or natural break in a hymn. But some authorities say that it was a direction to hymn singers to lift up their voices. Others suggest that it marked a pause in which the priest's voice was heard during responses or blessings.

W.A.I.

**SELECTION, NATURAL.** See NATURAL SELECTION.

**SELECTIVE BREEDING.** See ANIMAL HUSBANDRY (Improvement of Livestock).

**SELECTIVE SERVICE.** The Selective Training and Service Act of 1940 was the first peacetime draft act in the history of the United States. The act was adopted on



**A Seminole Indian Girl** gets acquainted with a small visitor, over a peppermint candy cane in a Florida village.

more than \$20,000,000 and the lives of 1,500 men. Osceola, their brilliant leader, was taken prisoner in 1837, when he attended a conference under a flag of truce. He died in prison in 1838. The Seminole in Florida remained unsubdued.

Today about 2,200 Seminole live on small farms in Oklahoma, as do their relatives, the Creeks. About 600 Seminole have remained in the Florida swamps. In the 1930's the Florida Seminole made official peace with the United States Government, which established an agency for them. Their life is healthful, and food is plentiful. They cultivate small gardens in the swamp clearings, and keep chickens, pigs, and cows. Some of the Seminole are hunters and fishermen. Their homes are on platforms raised above the swampland and roofed with palm thatch. They dress in cotton clothes, made in ancient Spanish style. The Seminole men wear long smocks and the women wear blouses and ankle-length skirts. Their clothes are often decorated with rows of brightly colored calico, carefully sewed on in imitation of ribbon trimming. R.M.U.

See also FIVE CIVILIZED TRIBES; INDIAN, AMERICAN (Table of Tribes; color plate); OSCEOLA.

**SEMINOLE WAR.** See FLORIDA (History [Territorial Days]); MONROE, JAMES (War with the Seminole).

**SEMIPOSTAL STAMP.** See STAMP COLLECTING (Special Stamps).

**SEMIRAMIS**, *seh MIR'ah mis*, was a mythical queen of Assyria. She was supposed to be the founder of the ancient city of Babylon, and the conqueror of Persia and Egypt.

Semiramis was the daughter of a Syrian youth and a fish goddess. Her mother left her, and she was fed by doves. Semiramis grew to be a beautiful woman and married King Ninus of Assyria. She became queen when he died and won many battles, but her son overthrew her and her name was forgotten. Herodotus mentions a Semiramis who was queen of Babylon in the 700's B.C.

P.COL.

**SEMIRELIEF.** See RELIEF.

**SEMITE**, *SEM ite*. Properly speaking, there is no such thing as a Semitic race. Semites are those who speak Semitic languages. In this sense the ancient Hebrews, Assyrians, Phoenicians, and Carthaginians were Semites. The Arabs and some Ethiopians are modern Semitic-speaking peoples.

Semitic peoples gave the world the idea of one God. They started three great religions, Judaism, Christianity, and Islam, or Mohammedanism. The world also is indebted to a Semitic people — the Phoenicians — for the invention of the alphabet. The great literary achievements of the Semites are the Bible and the Moslem Koran.

**Modern Semitic Peoples.** Most Semitic-speaking peoples are of the Mediterranean race. Modern Jews are often called Semites, but this name properly applies only to those who use the Hebrew language. The Jews were once a sub-type of the Mediterranean race, but they have mixed with other peoples until the name *Jew* has lost all racial meaning.

Semitic-speaking Mediterraneans of today are usually from about five feet three inches to five feet seven inches tall. They have dark wavy or curly hair, and dark brown eyes. The so-called "Semitic nose" is a trait inherited from peoples who lived in Armenia and the Iranian Plateau. Typical modern Semites are the Bedouins of Northern Arabia and the Himyarites of South Arabia. W.M.K.R.

**Related Subjects.** The reader is also referred to:

Arithmetic	Jew
Bedouin	Judaism
Christianity	Races of Man (Race Prejudice)
Islam	Semitic Language

**SEMITIC LANGUAGE.** The Semitic languages are very old. They are now spoken mainly in Arabia, Palestine, Syria, and Iraq, and in Egypt and the other North African countries. The Semitic languages include Assyrian, Aramaic, Syrian, Canaanitic, Phoenician, Hebrew, Arabic, and Ethiopic. The Aramaic language was spoken by Jesus.

The Semitic languages are supposed to have been the first to develop a true alphabet. And they are among those languages which have the longest recorded history. The greatest literary achievements of the Semites are the Bible and the Koran. Of the ancient Semitic languages, Hebrew is the only one that has survived as a spoken language.

The Assyrian and Babylonian languages have been preserved extensively as literary monuments of the past. They were written in wedge-shaped characters known as *cuneiform*. L.C.M.

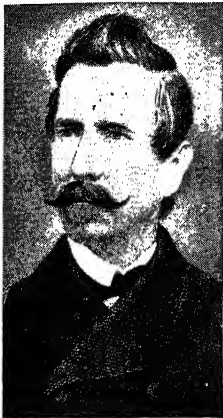
See also ALPHABET; ARAMAIC; CUNEIFORM; HEBREW LANGUAGE AND LITERATURE.

**SEMLIKI**, *SEM lee kee*, **RIVER.** See ALBERT, LAKE.

**SEMMELEWEISS, ZEM el vise, IGNAZ PHILIPP** (1818-1865), was a Hungarian doctor who first began antiseptic methods in childbirth. He was born in Budapest and studied medicine at the Vienna General Hospital. In this hospital Semmelweis discovered that childbed fever, which then killed about twelve mothers out of every hundred, was contagious, and that the doctors themselves were spreading the disease by not cleaning their hands. But his theories were laughed at, and he was forced to leave Vienna. He died of blood poisoning shortly afterward in a Viennese hospital for the mentally ill. In the same year Lister performed his first antiseptic operation and soon afterward the world admitted that Semmelweis had been right.

F.E.C.

**SEMMESE, semz, RAPHAEL** (1809-1877), was an American naval officer. During the War between the States he



Brown Bros.

**Raphael Semmes**, Confederate naval commander in the War between the States

law in Mobile, Ala. See also ALABAMA (Ship). C.L.L.

**SEMPACH, ZEM pahk, BATTLE OF.** See SWITZERLAND (History); WINKELRIED, ARNOLD VON.

**SEMPRONIUS GRACCHUS.** See GRACCHUS.

**SENATE** is the upper and usually the smaller branch of the legislature in various countries such as the United States and France.

**United States Senate.** The United States Senate was created as the result of a compromise at the Constitutional Convention of 1787. The delegates from the small states insisted that their states be given equal representation in one chamber of the legislature, because the large states had an advantage over the small ones in the House of Representatives. The Convention delegates finally decided that each state should have two Senators. Today this gives the Senate ninety-six members.

The authors of the Constitution were also afraid of too much control of government by the common people. They did not yet trust the people to manage their own affairs. So they decided that the people should not choose Senators directly, but that the state legislatures should choose them.

The Constitution sets forth the following qualifications for a Senator: he must be at least thirty years old; must have been a citizen of the United States for nine years; and when elected, must be a resident of the state

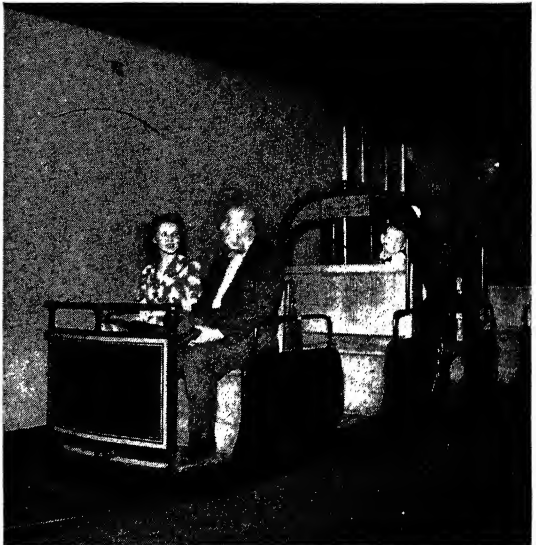
from which he was elected to the office of Senator.

The first Senators were usually wealthy or influential persons. This was because the state legislatures, rather than the people, chose the Senators. Later, Senators often represented a special industry, company, or interest, so that people came to speak of them as oil Senators, sugar-trust Senators, iron-and-steel Senators, railroad Senators, and so on. The spread of democratic beliefs finally led to a strong reaction against the indirect election of Senators. The Seventeenth Amendment, adopted in 1913, provided that they should be elected directly by the people.

**Organization of the Senate.** Every member of the House of Representatives comes up for re-election every two years, but Senators are elected for six-year terms. Only one third of the Senators come up for re-election at any one time. The advantage of this system is that there can never be a complete turnover in the Senate. As new men come in, there will always be old members who have had sufficient experience to manage the affairs of the Senate until they can educate the new men in senatorial procedure.

The Vice-President of the United States is the presiding officer of the Senate. He is not a member of the Senate, and votes only in case of a tie. He has much less control over the rules which control the Senate than the Speaker of the House has over the rules which control the House of Representatives. The Senate makes its own choice of officers other than the presiding officer.

Debate in the Senate is much more difficult to limit than debate in the House. Senators can argue an issue for an indefinite length of time, unless by a two-thirds vote they agree to limit the discussion. Two thirds of the Senate members will rarely agree to limit debate. So on many occasions a small group of Senators has been able to prevent a law from coming to vote. The practice of carrying on unlimited discussion in order to block legis-



Rosenthal, Pix

**The Senators' 250-Yard Electric Train** runs from the Senate Office Building to the Capitol. Noted as the only underground train in Washington, D.C., it has a one-rail track. The trolley runs on a steel beam, which holds the car upright.



Harris & Ewing

#### Special Session of United States Senate Held in the Capitol at Washington, D.C.

lation is known as *filibustering*. See **FILIBUSTERING**.

Like the House, the Senate carries on much of its work by means of a committee system. There are fifteen standing (permanent) committees, and several special committees. These include the committee on finance, which corresponds to the House committee on ways and means; the committee on appropriations; the committee on foreign relations, which handles all foreign treaties and all nominations of diplomatic and consular officers; the committee on the judiciary, which handles all nominations to Federal judgeships; the committee on interstate commerce; and the committee on banking and currency. These committees are elected by the Senate in much the same manner that the House elects its committees.

**Executive Functions.** The Fathers of the Constitution intended the Senate to serve as an advisory council to the President in treaty making and in appointments to office. The Constitution states that the ratification of treaties requires the "advice and consent" of two thirds of the Senate. The Senate has sometimes wrecked a presidential foreign policy by refusing to ratify a treaty. This happened in 1919, when President Woodrow Wilson submitted the Treaty of Versailles to the Senate and the Senate refused to ratify it.

About 17,000 of the most important Federal officers are appointed by the President with the confirmation of the Senate. These include Federal judges and the heads of executive departments. By custom, the Senate

generally confirms presidential appointments, although occasionally it refuses. By a long-established custom called "senatorial courtesy," the individual Senators usually suggest candidates to the President for positions within their home states. When the President ignores the custom and nominates men without such approval, the Senate usually refuses to confirm the appointment.

**Inequality of Representation in the Senate.** People have sometimes criticized the Senate rules of procedure as being difficult and clumsy. People have also criticized the inequality of representation which the Senate provides. For example, New York has a population of more than thirteen million, but it has no larger voice in the Senate than Nevada, which has a population of only about a hundred and ten thousand. Because of the unequal representation, Senators who represent only a minority of the United States population can sometimes prevent the passage of legislation which the majority wants. For example, in recent years southern Senators have been able to block antipoll tax legislation and legislation designed to give equal treatment in employment to members of different races.

G.E.M.

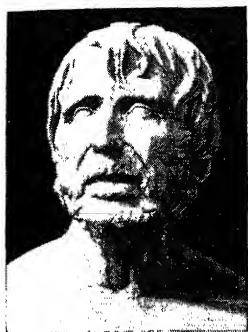
**Related Subjects.** The reader is also referred to:

Address, Form of	Representatives, House of
Canada, Government of	United States Constitution
(Legislative)	(Article I; Amendments
Congress of the United	[Article XVII])
States	Vice-President
Parliament	



**SENATOR.** See ADDRESS, FORM OF.

**SENECA**, *SEN ee kah* (4 B.C.?-A.D. 65), was a Roman philosopher and statesman. He taught the philosophy of the Stoics, who believed that man must take whatever fate is given to him, because the world is the work of divine wisdom and must not be questioned. Seneca's philosophical writings are noted more for his broad viewpoint and his sympathetic treatment of moral problems than for deepness of thought.



Culver

**Seneca**, Roman philosopher who taught the infamous Nero

Seneca was born in Córdoba, Spain, the son of a noted Roman lawyer. He studied under the Stoic philosopher Attulus, and later traveled in Greece and Egypt. Seneca began to practice law in Rome and became so famous that he was made a quaestor.

In A.D. 41 Seneca was exiled from Rome, but Empress Agrippina recalled him and made him the tutor of her son Nero, who became the next emperor. (See NERO.) For a few years Seneca was able to control his pupil and practically governed the country. But he lost his influence with Nero and in A.D. 65 Nero forced him to commit suicide.

B.B.

**His Works** include writings on such subjects as *Consolation* and *Peace of Mind*. He is also believed to have written ten tragedies that had an important influence on Renaissance drama.

**SENECA, COLLEGES OF THE**, is a corporation consisting of two colleges, Hobart College and William Smith College. Both colleges are in Geneva, N.Y., and are controlled by the Episcopal Church.

The colleges have separate campuses, yet share common facilities such as the library and the scientific laboratories. Both colleges are open to students of all faiths.

**Hobart College** is a men's school. It is the oldest college controlled by the Episcopal Church in the United States. Courses are offered in the liberal arts and sciences. The college was founded in 1822 and has an average enrollment of about 400.

**William Smith College** is a women's school of liberal arts and sciences. The college was founded in 1908 and has an average enrollment of about 250.

E.E.S.

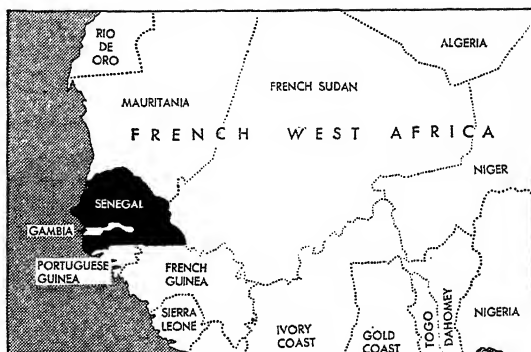
**SENECA INDIAN.** See INDIAN, AMERICAN (Table of Tribes [Iroquois]).

**SENECA LAKE.** See FINGER LAKES.

**SENEFELDER**, *ZÄ neh FEL der*, **ALOYS** (1771-1834). See LITHOGRAPHY.

**SENEGAL**, *sen ee GAWL*, is a French colony in the western part of French West Africa. Included in Senegal is the separately governed District of Dakar. Senegal covers an area of 77,730 square miles, and has a population of 1,739,000. The people are chiefly Negroes and Negro Hamitic mixtures. See HAMITE.

Senegal is the oldest French colony in Africa. The natives and Frenchmen who live in St. Louis, the capital of Senegal, and in the towns of Dakar, Gorée, and Rufisque (all in the District of Dakar) are French citi-



Location Map of Senegal

zens. All other natives are French subjects without the privileges of citizenship.

The climate of Senegal is divided into a wet and dry season. The temperatures are always high. Most of the colony is a land of high bushes and tall tropical grasses. The unusual *baobab* tree grows in Senegal (see BAOBAB). The wild animals of the country include deer, antelope, wart hogs, lions, and leopards.

The chief products of Senegal include peanuts, rubber, millet, and maize (corn). Most of the natives are farmers, but some work at such industries as weaving, jewelry making, and brick and pottery production.

Dakar is the chief commercial center for French West Africa. It was a naval base for Vichy France during World War II. The Allies took over Dakar after the invasion of North Africa, in 1942.

H.V.B.K., Jr.

See also DAKAR; FRENCH WEST AFRICA; RACES OF MAN (color plate, Africa).

**SENEGAL RIVER** is a stream which flows through the French West African colony of Senegal on the southwestern border of the Sahara. The Senegal rises in the mountains of Futa Jallon, and flows west and north for nearly 1,000 miles. The Senegal empties into the Atlantic Ocean 110 miles north of Cape Verde. The upper course of the river has many rapids, but near the coast the stream becomes deep and sluggish. Ships can sail about 460 miles inland.

The river has two picturesque falls, named Guine and Felu, each about fifty feet high. The region drained by the Senegal River is hot and unhealthy. The soil is not very fertile, except where it is covered with forest and rank jungle growth. The river does not empty its waters directly into the sea, but flows into a lagoon which is separated from the sea by a shifting bar of sand.

S.J.S.

**SENEGAMBIA**, *SEN ee GAM bih ah*, was the former name of the African territory which is now known as Senegal. See SENEGAL.

**SENEGA SNAKEROOT.** See SNAKEROOT.

**SENILE DEMENTIA**, *SE nile dee MEN shih ah*. See INSANITY.

**SENILITY**, *see NIL ih tih*, is the physical and mental weakness that often comes with old age. The period just before senility, when the body is aging but not really weak, is called *senescence*.

Not all persons become senile, and senescence begins later in some persons than in others. But most persons are beginning to grow old by the age of 65. In many organizations, the retirement age is 65.

The body cells of old persons lose the power of repairing wear and injury and the tissues become less able to adjust to various stresses. Hardening of the arteries tends to bring on other changes, for the whole body depends on the blood for nourishment. P.R.C.

See also ARTERIOSCLEROSIS; CANCER; LIFE, LENGTH OF.

**SEN LAC.** See HAROLD (II, England); HASTINGS, BATTLE OF.

**SENNA, SEN** *ah*. See CASSIA.

**SENNACHERIB**, *seh NACK er ib* (reigned 705-681 B.C.), was a famous king of Assyria who is mentioned in the Old Testament. He was the son of Sargon II. Like his father, he carried on many wars to expand his kingdom. Sennacherib's conquests included Sidon, Ashkelon, and Ekron. His most noted war was that against Hezekiah, king of Judah, in which, according to the Old Testament, the strength of Sennacherib was cut down by the Angel of the Lord. Sennacherib's own records also tell of the siege of Jerusalem. He boasted that he had shut up Hezekiah like a bird in a cage, but he did not state that he had captured the city.

Sennacherib was a vigorous ruler and was interested in the arts, crafts, sciences, and sports. But he was jealous of the culture of Babylon. He marched against that famous city in 689 B.C. and completely destroyed it. Soon afterward his own family revolted against him and his sons murdered him. E.A.S.

**SENSATION.** See PERCEPTION; SENSES.

**SENSES.** The senses of the body bring us our sensa-

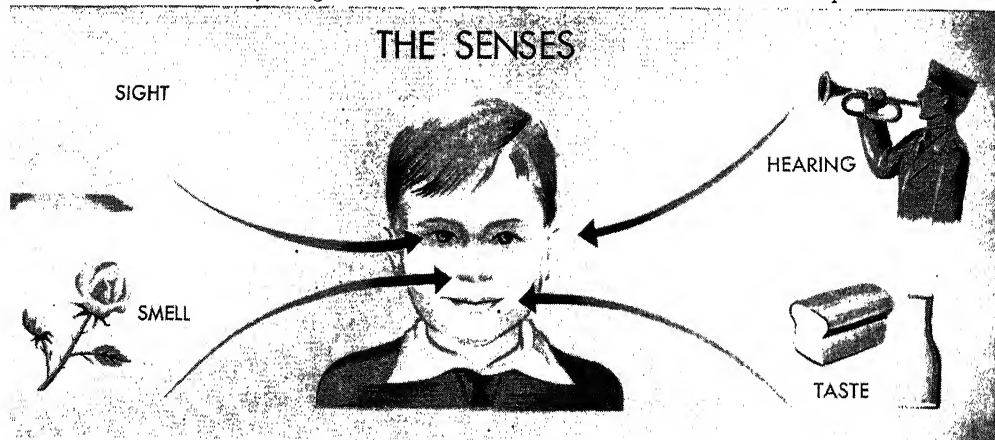
tions — sights, sounds, tastes, smells, and feelings of hardness, weight, heat, cold, hunger, thirst, weariness, and pain. The senses begin to act when something disturbs one of the sense organs. These organs are connected to sensory nerves. A disturbance in the organ causes a nervous impulse in the sensory nerve. This impulse travels along the nerve to the brain, where it is interpreted. The person then becomes conscious of a sensation.

Most people speak of the *five senses*—sight, hearing, smell, taste, and feeling. But scientists have found other kinds of sense organs — many more than five.

For example, the different kinds of feeling that come through the skin have separate organs. The organs that feel pain cannot feel heat. There are still other organs for touch, pressure, and cold.

The senses which bring us knowledge of the world around us are called the *special*, or *exterior senses*. They include sight, hearing, smell, taste, touch, and temperature. These are our most delicate and exact senses. The senses that tell us of our body needs are called *general*, or *interior*, senses. Chief among these are hunger, thirst, fatigue, the sense of muscular movement (kines-thesis), and pain. Pain may be a warning that some organ is failing to act the way it should.

The senses may also be grouped by the different kinds of sense organs. The *exteroceptors* are organs that report things outside the body. The *interoceptors* report changes in the organs deep inside the body. These senses are sometimes called *organic*. For example, the sense of hunger comes from movements in the stomach. The sense of thirst comes from certain changes at the back of the throat. The sense of equilibrium tells our



YOUR SKIN IS A SENSE ORGAN



**Senses Are Found in the Skin.** The organs in the skin respond to pain, touch, heat, cold,

and to both light and heavy pressure. Separate organs respond to each kind of stimulus.



New York Botanical Garden

Leaves of the Sensitive Plant, When Touched (Left), Fold Up (Right)

position in space — right side up, or upside down. The sense organs for equilibrium are in the semicircular canals of the inner ear. A third type of sense organs, the *proprioceptors*, are inside our muscles and joints, and make us aware of their activity. Some scientists think the proprioceptors give us our sense of time and rhythm. Others think that the senses of time and space are separate from the other senses.

G.W.BE.

**Related Subjects.** The reader is also referred to:

Brain	Pain
Dog (Senses)	Sleep
Ear	Smell
Eye	Taste
Hyperesthesia	Thirst
Muscle Sense	Touch
Nervous System	

**SENSES OF ANIMALS.** See ANIMAL (Animal Sense Organs).

**SENSITIVE FERN.** See FERN (Classification).

**SENSITIVE PLANT** is a small shrub about eighteen inches high. It comes from South America and belongs to the same family as the pea. Its leaves are made up of many small leaflets. The plant is called "sensitive" because these leaflets fold over each other when the plant is shaken or touched roughly. At the same time, each of the leafstalks bends toward the main stem, as if the plant were shrinking from being touched. If the plant is then not touched again, it will slowly spread out its leafstalks and leaflets again.

The sensitive plant has been brought to the United States and is sometimes grown in greenhouses as a curiosity. The sensitive briar of the Southern states has the same habit of withering, but only when it is very roughly handled.

A.C.HO.

See also PARTRIDGE PEA.

**Classification.** The sensitive plant belongs to the *Leguminosae* family. Its botanical name is *Mimosa pudica*; *Mimosa*, because its leaf action mimics the nerves of an animal; *pudica* is Latin for *shy* or *modest*.

**SENSORY NERVE.** See NERVOUS SYSTEM.

**SENTENCE.** A sentence is a complete thought expressed in words. It may use one word or any number of words. "Stop!" is a clear, complete sentence. There are many other one-word sentences in our language. Sentences may also use many words. In one novel, there is a famous sentence of over a thousand words. Long sen-

tences may be confusing. But this famous long one is clear, because it is well put together.

Every sentence should begin with a capital letter. It should be followed by a punctuation mark to show that it has ended. The punctuation mark may be a period, a question mark, or an exclamation point, depending on the type of sentence. See CAPITALIZATION; PUNCTUATION.

**Parts of the Sentence.** The first part of a sentence usually names a person or thing. This part is called the *subject*. The second part is what that person or thing does, some action to be performed or some thing done. This part is called the *predicate*. Even in a one-word sentence, such as "Stop!" there are two parts. The word "you" is understood, even though one may not say, "You stop!" The word *you* is the subject of such a sentence, and the word *stop* is the predicate.

The subject is always a noun, a pronoun, or something equal to a noun or pronoun. The predicate is always a verb. The verb may be only one word, such as *boils*, *hurts*, *dawdles*, or it may contain several words, such as *will sleep*, *must have wounded*, *might have been struck*.

A subject of more than one word is called a *compound subject*, as in "*Boys, girls, and their noisy pets* crowded through the entrance." When a predicate has more than one verb it is called a *compound predicate*, as in "The various pets *barked, miaowed, cackled, grunted, and squealed.*"

**Purposes of Sentences.** Sentences do one or more of four things. A sentence may state a fact. Such a sentence is called *declarative* and is followed by a period. A sentence may issue an order. Then it is called *imperative* and is followed by a period. If it asks a question, it is called *interrogative* and is followed by a question mark. But if any one of these three types is delivered with strong feeling or emotion, the sentence is then described as *exclamatory* and is followed by an exclamation mark. A declarative sentence would be: *John hit the ball.* An imperative sentence would be: *Hit the ball, John.* An interrogative sentence would be: *Did John hit the ball?* The declarative sentence might become exclamatory in this way: *How hard John hit the ball!*

**Forms of Sentences.** There are three different kinds of sentences according to their forms. The simplest kind is

called the *simple* sentence. It expresses only one thought. It has one subject. The subject is a noun or pronoun. It may be a part of speech used as a noun or pronoun. All the words in the subject relate to it. The simple sentence has one predicate. The predicate is the verb with all the words related to it. Every sentence in this paragraph is a simple sentence. Simple sentences can be clear, straight forward, accurate, and varied in construction. Many of the greatest authors in English have been masters of the simple sentence. Being able to write simply is one of the highest arts.

The second kind of sentence is a *compound* sentence. This type usually joins two or more simple sentences with a word such as *and*, *but*, or *or*. "The boys cheered and the girls sang." In this sentence there are two simple sentences joined by the word *and* to make a *compound* sentence. In such a sentence, a comma should be placed to mark the end of the first part, unless the parts are very short.

Compound sentences are good for combining closely related ideas. There are some very familiar compound sentences, such as: *I came, I saw, I conquered. Give me liberty or give me death.* The ideas in a compound sentence should always belong together. The words, "It is cold out and cats are fine pets," is not a good compound sentence. It is not good writing or speaking to string ideas together with the word *and*, or, worse yet, *and so*. Very young children and ignorant and careless speakers use too many such compound sentences. Such speaking is annoying to the listener.

The third kind of sentence is called a *complex* sentence. In such a sentence there are two or more ideas of different importance. *When I went downtown, I saw an attractive suit.* The important idea of the suit is the principal thing in this sentence. The going downtown is not quite so important. It is said to be *subordinate*. In a complex sentence like this there are a *principal clause* and a *subordinate clause*. The principal clause is *I saw an attractive suit*. The subordinate clause is *When I went downtown*. A complex sentence may contain more than one subordinate clause. *When I went downtown, I saw an attractive suit which I should like to buy.* When the subordinate clause comes first in a complex sentence, it is followed by a comma. The preceding sentence is an example.

**Variety.** There is an old saying that "Variety is the spice of life." Variety makes life interesting. In speaking or writing, the careful person does not make all his sentences on the same pattern. He uses many different kinds. He begins and ends differently. Even if he uses only simple sentences, he can vary them. *I have never seen such confusion* may be *Never have I seen such confusion* or *Such confusion I have never seen*. Complex sentences also offer many different patterns for expression. *I stopped spellbound when I saw the car swerve toward the railing. When I saw the car swerve toward the railing, I stopped spellbound. Spellbound when I saw the car swerve toward the railing, I stopped.* See SYNTAX.

**Sentence Fragments.** Ordinary free and easy conversation does not always include complete sentences. It uses sentence fragments. *Where did you get that hat? At Harley's.* The answer is a fragment, or piece of a sentence, standing for *I bought it at Harley's.* Sentence

fragments are not good for writing or for speech which is intended to give exact information. They are used mostly in conversation.

**Clearness and Accuracy** are important in making a sentence. One may be clear without being accurate. *I worked days on that problem* is quite clear. It may be inaccurate, or untrue, if the person worked only eighteen hours. Good speech and writing call for both clearness and accuracy. Using good grammar helps in achieving accuracy and clarity. See GRAMMAR.

**Diagram of a Sentence.** The *diagram* of a sentence is merely a way to study it by taking it apart. It is a picture which shows what each part of the sentence does and what its importance is. Diagramming is useful in learning grammar and syntax.

The following types of sentences are diagrammed and can be used as models for other sentence diagrams.

*Simple Sentence: Travel is a great educator.*

Travel | is \ educator

**Explanation:** The principal parts of the sentence, the simple subject and simple predicate, are written on the heavy line. The line is cut by the heavy downward line to mark the division between the two parts. On the lighter slanting lines are the less important parts of the sentence, or modifiers. The short, slanting line separating *is* and *educator* shows that the noun is the *complement* of the verb, completing it. When it is a short line straight up and down, it shows the word following it is the *object* of the verb. See diagram under *Complex Sentence*.

*Compound Sentence: Travel, and you possess the world.*

(You) | travel  
| and  
you | possess world

**Explanation:** This sentence has two independent clauses joined by the word *and*. An independent clause is indicated by a heavy line beneath it. The direct object *world* is separated from its verb by a short line.

*Complex Sentence: They who travel widely acquire a broad, practical education.*

They | acquire | education  
| a broad practical  
who travel

**Explanation:** The independent clause is shown on the heavy line, the subordinate clause on the lighter line. The dotted line indicates that *who* is not only the subject of the subordinate clause but the connecting word between the two clauses.

**SENTENCE**, in law, is the period of prison confinement set by a court after an accused person has been found guilty of a crime for which the law provides prison punishment.

For many years, judges pronounced sentence on convicted criminals according to their own judgment. Now, however, most laws provide a maximum and a minimum sentence which may be imposed for each particular crime. For instance, a state law may provide that the prison sentence for burglary shall be not less than six months and not more than twenty years.

Many experts in criminology now believe there should be no maximum or minimum sentences, but that all prison sentences should be indefinite, or *indeterminate*. That is, a prisoner should be confined until qualified experts decide that he is reformed and ready to return to society.

A.E.W.

**SEOUL**, *seh OOL* (population 935,464), has been the capital of Korea since 1392. The city lies west of the swift-flowing Han River, and thirty-five miles from the seaport of Chemulpo. During the Japanese occupation of Korea, Seoul was renamed Keijo. The names mean *capital* in both the Korean and Japanese languages.

Seoul is Korea's educational and scientific center. Modern buildings and transportation systems add an up-to-date touch to the ancient city. Industries include the making of silk, paper, mats, and fans. The Japanese occupied the city in 1910 and held it until the end of World War II.

**SEPAL**, *SE pal*. See FLOWER (Calyx; illustration, Parts of a Flower).

**SEPARATE SCHOOL SYSTEM**. See CANADA (Education).

**SEPARATE SYSTEM**. See PRISON (History).

**SEPARATISTS**. See COLONIAL LIFE IN AMERICA; PILGRIM; PURITAN.

**SEPARATOR**. The first cream separators were crude wooden spoons that farmers used to skim cream off the top of milk. The farmers would let whole milk stand for several hours until cream, which is lighter than the rest of the milk, rose to the top. Then they would dip the cream off. This method was very wasteful, as it left from 30 to 40 per cent of the valuable cream in the milk.

In 1878 Gustav de Laval, a Frenchman, invented a mechanical separator which removed all except a trace of cream from the milk. Modern separators work on the same principle as De Laval's. They consist mainly of a large storage tank, a rotating bowl, a cream outlet, a milk outlet, and a crank or electric motor for turning the bowl. Whole milk is poured into the supply tank and drains in small quantities into a smaller bowl below. The bowl begins to turn very fast. The centrifugal force that the revolving bowl sets up forces the light cream in the milk toward the center of the bowl. At the same time, the heavier ingredients of milk are thrown toward the outer shell of the bowl. The cream at the center of the bowl drains off into one container, and the remaining milk drains off into a separate container.

Separators range in size from small, hand-operated machines which handle only 150 pounds of milk an hour to large, power-driven machines which can handle thousands of pounds of milk each hour.

E.T.L.

See also CENTRIFUGE; CREAMERY.

**SEPIA**, *SE pih ah*, is a pigment of dark-brown color made from an inky fluid found in certain cuttlefish. The fluid is dried to a powder, and then treated with caustic alkali and acids. Sepia is used to a limited extent to make water colors and drawing ink. The term *sepia* also applies to pigments of similar color made from other materials. See also CUTTLEFISH.

T.M.

**SEPIOLITE**, *SE pih oh lite*. See MEERSCHAUM.

**SEPOY REBELLION**. In May, 1857, native troops revolted in India. This mutiny was called the Sepoy Rebellion. It resulted in the transfer of the government of India from the British East India Company to the British Government. The word *sepoy* comes from the Hindi word *sipahi*, which means *a native of India who is a soldier in the British Army*.

The natives of India were dissatisfied because the British were trying to substitute British civilization for the Indian ways of life. The British paid no attention to native customs and beliefs which were important to the Indian population. The immediate cause of the rebellion was the British order that the sepoys must use greased cartridges. Some of the cartridges were greased with fat from hogs. To use them, the sepoys had to bite the end patches from the cartridges. The religion of the Hindus forbade them to taste anything prepared from the meat of a cow, and that of the Moslems forbade the use of pork. So they refused to use the cartridges. The British officers, who acted for the East India Company which then ruled India, thought this was a foolish prejudice, and demanded that the order be obeyed.



National Dairy Council

**A Cream Separator** turns whole milk into cream (flowing into container at left) and skimmed milk.

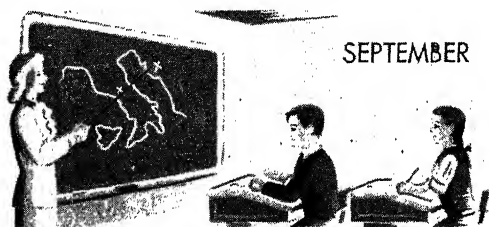


On May 10, 1857, native troops revolted at Meerut, a town near Delhi. The revolt spread, and the sepoy next seized Delhi. Nana Sahib took over the leadership of the sepoys and caused a massacre of men, women, and children at Cawnpore. Lucknow was besieged but finally received aid from British forces under Sir Henry Havelock. Sir Colin Campbell's troops saved the city. By June, 1858, the revolt was almost crushed, although fighting continued at the city of Oudh until the beginning of 1859.

The mutiny showed Great Britain and the East India Company that the company alone could no longer control India. In 1858 the British Government took over the management of Indian affairs. The British ruler became the ruler of India also. The effects of the Sepoy Rebellion made it one of the most important episodes in the history of British India.

H.F. MacN.

See also CAWNPORE; EAST INDIA COMPANY; HAVELLOCK, HENRY, SIR; INDIA (History and Government [Rebellion of 1857]); LUCKNOW; NANA SAHIB.



**SEPTEMBER** is the ninth month of the year. It was the seventh month in the old Roman calendar. Its name comes from the Latin word *septem*, meaning *seven*. September became the ninth month when Julius Caesar added two months to the calendar. Many months have had the number of their days changed, but September has had thirty since old Roman times.

**Activities.** Summer ends and autumn begins on September 22 in the northern half of the world. The weather is a mixture of summer and autumn. September is one of the warmest months in the southern United States, and states farther north have hot days during September. The nights are likely to be cool, and there are touches of the golden haze which makes later autumn days so beautiful.

September is a busy time on the farm, for it is the harvest month for many crops. While the earth lies bare of its produce, the farmers labor long and hard to store away the rich harvests. In Charlemagne's calendar September was called the "harvest month," and it still has that name in Switzerland. The Anglo-Saxons called it the "barley month."

**Special Days.** The only national holiday that falls in September is Labor Day. It falls on the first Monday of the month in Canada and in most of the states of the Union. After Labor Day, summer vacations usually end. Children return to school, while adults take up fall and winter activities.

Many nations have held harvest festivals in September. The Greeks honored Demeter during this month, and the Romans gave a feast in honor of Ceres. The Hebrew New Year, Rosh Hashanah, comes in either September or October. Many countries of Europe in

later days celebrated the end of the harvest with feasts and games. In America the Harvest Home supper was celebrated on many farms at the end of the harvest. Fairs and harvest festivals are often held in September.

Constitution Day is observed in many schools on September 17. This is the day on which the Constitutional Convention completed its work of drafting the Constitution of the United States (1787).

**September Symbols.** The morning-glory is the flower for September. The sapphire is the gem.

G. Hum.

See also CALENDAR; HARVEST MOON; LABOR DAY; POPPY; SAPPHIRE.

#### Birthdays of Famous Persons in September

1. James Gordon Bennett, 1795, newspaper publisher.
2. Henry George, 1839, American economist.  
Eugene Field, 1850, American poet and journalist.
3. Sarah Orne Jewett, 1849, American author.  
Louis H. Sullivan, 1856, American architect.
4. Daniel H. Burnham, 1846, American architect, champion of city planning.  
Phoebe Cary, 1824, American poet.  
Marcus Whitman, 1802, American missionary and pioneer.
5. Cardinal Richelieu, 1585, French statesman.
6. Jane Addams, 1860, social worker, founder of Hull House in Chicago.  
John Dalton, 1766, English chemist and physicist.  
Marquis de Lafayette, 1757, French statesman and soldier who fought for America in the Revolutionary War.  
Horatio Greenough, 1805, American sculptor.
7. Queen Elizabeth, 1533, Tudor Queen of England (1558-1603).  
John Pierpont Morgan, Jr., 1867, American financier.
8. Anton Dvořák, 1841, Bohemian composer.  
Richard I, 1157, second Plantagenet king of England (1189-1199).  
Peter Stuyvesant, 1592, Dutch governor of New Amsterdam.
10. Arthur H. Compton, 1892, American physicist.  
Thomas Sydenham, 1624, English physician.
11. William Sydney Porter (O. Henry), 1862, American short-story writer.  
Sir James Jeans, 1877, English physicist and astronomer.
12. Richard J. Gatling, 1818, inventor of Gatling gun.  
Richard Hoe, 1812, inventor of rotary press.
13. John J. Pershing, 1860, American general in World War I.  
Walter Reed, 1851, American army surgeon who discovered cause of yellow fever.
14. Charles Dana Gibson, 1867, American illustrator.  
Baron Alexander von Humboldt, 1769, German naturalist and statesman.
15. James Fenimore Cooper, 1789, American novelist.  
William Howard Taft, 1857, twenty-seventh President of the United States.
16. Hamlin Garland, 1860, American author.  
James J. Hill, 1838, American railroad builder.  
Francis Parkman, 1823, American historian.  
Tintoretto, 1518, Italian painter.
17. Baron Friedrich Wilhelm von Steuben, 1730, Prussian soldier who trained American troops in Revolutionary War.
18. Jean B. Foucault, 1819, French physicist.  
Samuel Johnson, 1709, English author and dictionary maker.
19. Louis Kossuth, 1802, Hungarian patriot.
20. Alexander the Great, 356 B.C., Greek conqueror of Persia.

- Robert Emmet, 1778, Irish patriot.  
 Louis Joliet, 1645, French explorer.  
 Girolamo Savonarola, 1452, Italian friar and reformer.  
 H. G. Wells, 1866, English novelist and historian.  
 Earl of Chesterfield, 1694, English statesman and author.  
 Michael Faraday, 1791, English chemist and scientist.
23. Augustus Caesar, 63 B.C., first Roman emperor.
  - Euripides, 480 B.C., Greek playwright.
  24. John Marshall, 1755, great Chief Justice of the United States Supreme Court.
  - Horace Walpole, 1717, English author.
  25. Felicia D. Hemans, 1793, English poet.
  26. George Gershwin, 1898, American composer.
  27. Samuel Adams, 1722, American Revolutionary patriot.
  - George Cruikshank, 1792, English caricaturist.
  - Alfred T. Mahan, 1840, American naval officer and historian.
  - Thomas Nast, 1840, American cartoonist.
  28. Georges Clemenceau, 1841, French premier during World War I.
  - Kate Douglas Wiggin, 1856, American author and educator.
  - Frances E. Willard, 1839, American temperance leader.
  29. Robert Clive, 1725, British soldier and founder of British rule in India.
  - Admiral Horatio Nelson, 1758, British naval hero.
  - Henry H. Richardson, 1838, American architect.
  30. Pompey, 106 B.C. Roman general.

**Notable September Events**

- German Army invaded Poland, beginning World War II, 1939.  
 Start of Japanese earthquake which killed 99,331 persons, 1923.  
 Great fire in London, September 2-6, 1666.  
 Treasury Department of United States organized, 1789.  
 England and France declared war on Germany, 1939.  
 Benedict XV, elected 260th Pope, 1914.  
 Treaty of Paris signed by United States and Great Britain, 1783.  
 Third Republic declared in France, 1870.  
 First Continental Congress met in Philadelphia, 1774.  
 Battle of the Marne, September 6-10, 1914.  
 President McKinley assassinated, 1901.  
 Brazil proclaimed its independence from Spain, 1822.
9. California admitted to the Union, 1850.
  10. Battle of Lake Erie, 1813.
  - Elias Howe patented first sewing machine, 1846.
  11. Battle of Brandywine, 1777.
  14. Great Britain and American colonies adopted the Gregorian calendar, 1752.
  - "Star-Spangled Banner" written by Francis Scott Key, 1814.
  - Retreating Russians burned Moscow, 1812.
  - Independence Day in the Central American republics, 1821.
  - Russia proclaimed a republic, 1917.
  16. Pilgrims sailed from England in the *Mayflower*, 1620.
  17. Constitution of the United States completed, 1787.
  18. Quebec surrendered to the English, 1759.
  - Chile won independence from Spain, 1810.
  - Washington delivered his Farewell Address, 1796.
  - President Garfield died of assassin's shot, 1881.
  21. Great hurricane swept the Atlantic Coast, 1938.
  22. Lincoln issued preliminary proclamation freeing the slaves, 1862.

- Nathan Hale put to death as a spy, 1776.
23. John Paul Jones, commanding the *Bonhomme Richard*, defeated the British ship *Serapis*, 1779.
  25. Balboa discovered the Pacific Ocean, 1513.
  - Publick Occurrences*, first American newspaper, appeared in Boston, Mass., 1690.
  27. The *Queen Elizabeth*, largest steamship ever built, launched at Glasgow, Scotland, 1938.
  28. William the Conqueror landed in England, 1066.
  - Battle of Marathon, 490 B.C.

**Quotations for September**

By all these lovely tokens  
 September days are here,  
 With summer's best of weather  
 And autumn's best of cheer. Helen Hunt Jackson

The morrow was a bright September morn;  
 The earth was beautiful as if newborn;  
 There was that nameless splendor everywhere,  
 That wild exhilaration in the air,  
 Which makes the passers in the city street  
 Congratulate each other as they meet. Longfellow

Just after the death of the flowers,  
 And before they are buried in snow,  
 There comes a festival season  
 When Nature is all aglow. Author Unknown

Heap high the farmer's wintry hoard!  
 Heap high the golden corn! Whittier

**SEPTEMBER MASSACRE.** See MARAT, JEAN PAUL.  
**SEPTICEMIA**, *SEP tih SE mih ah*. See BLOOD (Diseases of the Blood).

**SEPTIC**, *SEP tick*, **TANK**. See SEWAGE.

**SEPTIME**, *SEP teem*. See FENCING.

**SEPTUAGINT**, *SEP tyoo ah jint*, is the oldest Greek translation of the Old Testament. It is believed that it was begun in the 200's B.C. in Alexandria, Egypt. The translation was completed before the Christian Era. The most famous copies of the Septuagint are contained in the Biblical manuscripts called *Vaticanus*, *Alexandrinus*, and *Sinaiticus*.

The name *septuagint* is from a Latin word meaning *seventy*. It is commonly supposed to refer to an early belief that the translation was made in seventy-two days by seventy-two scholars. Modern Biblical students question this belief. The Septuagint is valuable as the first large-scale literary translation. It is commonly indicated by the Roman numerals LXX. W.A.I.

**SEPTUM**, *SEP tum*. See NOSE.

**SEQUOIA**, see *KWOT ah*. The sequoia trees are the oldest living things on earth. They are the lordly cone-bearing evergreen trees of California. There are two species. One is the so-called *big tree*, or *giant sequoia*, and the other is the *redwood*. Both are truly gigantic trees, and may live to be thousands of years old.

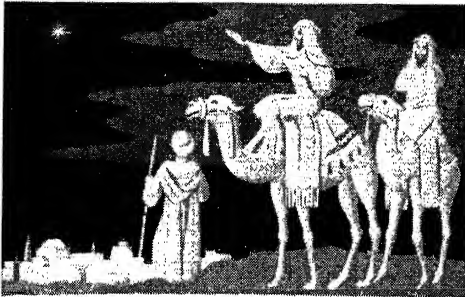
The redwood grows only in the mountains near the Pacific Coast, from Oregon south to California. The tree is found in more than one half of the northern part of the state. All redwoods grow west of the great Central Valley of California. They have tall straight trunks which may be fifteen to eighteen feet through and more than 300 feet high. The bark is a dark brown which becomes changed by the weather to slate gray as the tree grows older. Many branches grow almost at right angles to the trunk, and may droop downward. The tallest redwood, called Founder's Tree, is 365 feet high. It is considered the tallest tree in the world. The name



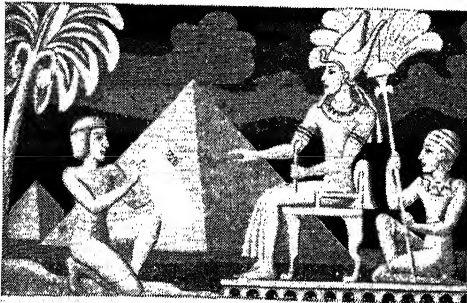
The Present Time



1100 A.D.



At The Time Of The Birth Of Christ

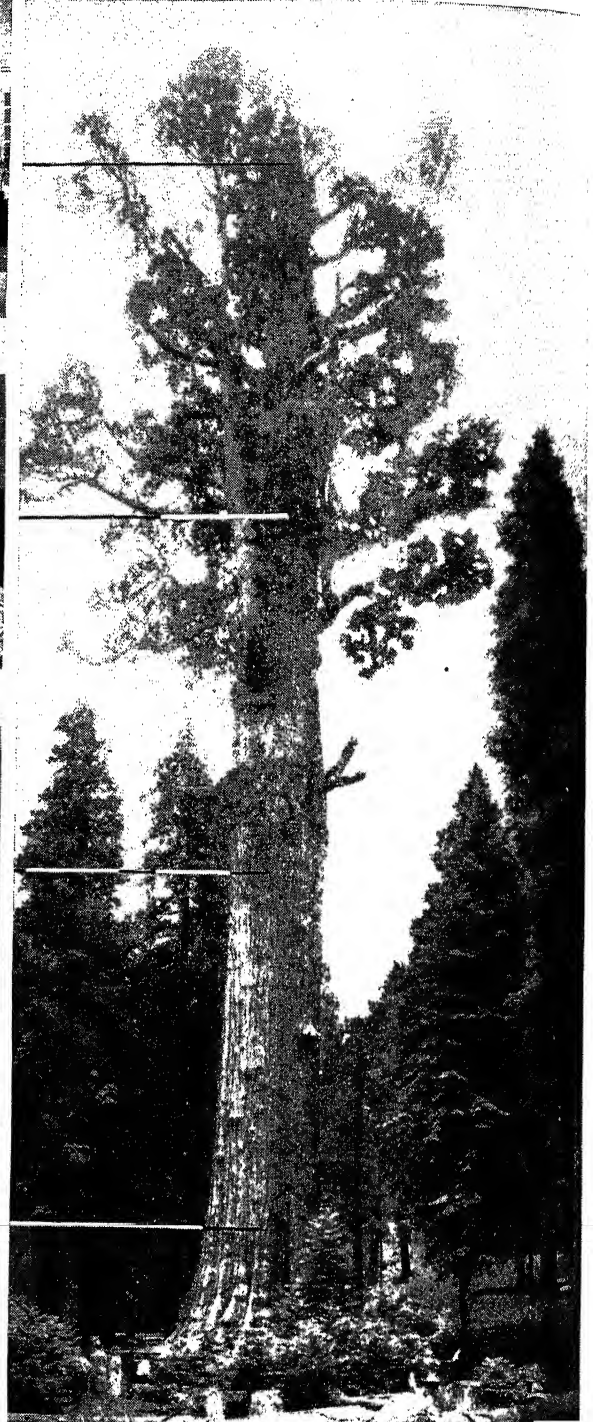


2000 B.C.

Photo © Laval Co., Inc. Drawing and photo used through special permission of Glenside Co., Inc. **The Oldest and Largest Living Thing on Earth.** This forest is the General Sherman, California, com-

redwood comes from  
lumber is valuable  
is easy to

color of the wood. This  
The wood is very dura-  
It takes a satiny finish. It  
widely used for woodwork, and for the siding of houses.  
Sometimes the trees develop large burls which have



Biology

compares in age with the Pyramids, man's oldest remaining handiwork. It has grown through four thousand years of man's history.

a curly grain and are popular for making choice furniture. When old trees are cut down, the stumps that remain sprout new branches, which are well rooted and rapidly grow into large, upright trees. The redwoods grow back more rapidly than any other cone-bearing

forest tree. But a thousand years may be necessary to grow a new tree as large as the one which was cut down. The largest redwoods contain enough lumber in each tree to build several houses.

The redwood's leaves are flat needles about an inch long, and usually spread out flat on both sides of the twig. The twigs look somewhat like those of the fir or the yew. A young redwood tree in a park or lawn has a beautiful conical shape, with many branches growing along the trunk to the ground. An old forest tree may have no branches on the lower 100 feet of the trunk.

The seeds are small, less than one sixth of an inch across. They are borne in somewhat oval-shaped cones which are seldom more than an inch long. The seeds are flat and tucked in between the scales of the cone. When the seeds are ripe they drop out as the cone dries at the end of the season.

**The Giant Sequoia**, or big tree, grows on the western slope of the Sierra Nevada range in California from 5,000 to 7,800 feet above sea level. This region is 150 to 120 miles east of the redwood belt and is on the east side of the San Joaquin Valley. The giant sequoias are not so widely distributed as the redwoods. They grow in groves ranging from a few acres to several square miles in area, and they are always near other trees such as the sugar pines, firs, and incense cedars. More than fifty groves have been found.

The Calaveras grove was the first discovered in 1852. The Mariposa grove at Yosemite National Park is well known, and has many large trees, including the Grizzly Giant and Wawona tree. About 150 miles to the south, several groves merge into one large, almost continuous area in the Giant Forest in Sequoia National Park.

Giant sequoias do not grow so tall as redwoods, but their trunks are much larger. Several of them measure about 100 feet around at the base. The General Sherman in Giant Forest is 272.4 feet high and has a diameter of 36.5 feet at the base. This tree alone would yield more than 600,000 board feet of lumber. Some of the other individual very large trees are the General Grant, Boole, Hart, Abe Lincoln, and Roosevelt. These trees and others like them are the world's largest forms of life.

Many of the giant sequoias are several thousand years old. It is now against the law to cut them down, but one of the largest and oldest which was cut down before the law was passed dated back to 1305 B.C. This tree was nearly 3,200 years old when it was cut down. The age was computed from the rings in the trunk. Many persons believe the General Sherman tree is between 3,000 and 4,000 years old.

The wood of the giant sequoia is red, like that of the redwood, but is much lighter in weight. Some persons

call the giant sequoia the *Sierra redwood* and call the others the *coastal redwood*. The wood of the big tree may be used for the same purposes as redwood lumber, but giant sequoia wood is now fairly scarce. Only the logs of trees that have fallen are sometimes made into lumber, since the trees are protected by law.

The bark of the giant sequoia is a rich cinnamon red. The leaves are small, usually less than one fourth of an inch long. They stand out on all sides of the twigs, and the foliage resembles that of a coarse juniper. The branches grow upward at an angle. The tips of branches which do grow straight out at first tend to grow upright, giving the tree a different appearance from the redwood.

The cones are somewhat oval in shape, between two and three inches long, and very hard and woody. They cannot be crushed in the hand. The seeds are flat and borne on the surface of the cone scales. They fall out when the cone becomes dry. Two years are needed for the seeds to mature, and most of them stay within the cone, which may remain green on the trees for a dozen years after the seeds are ripe.

J.T.B.

See also CONE-BEARING TREES; REDWOOD.

**Classification.** Both the redwood and the giant sequoia belong to the family *Taxodiaceae*. The giant sequoia is *Sequoiadendron giganteum*. The redwood is *Sequoia sempervirens*.

**SEQUOIA NATIONAL PARK** is the home of one of the finest existing stands of giant sequoia trees, which are among the oldest and largest living things in the world. In this park are thousands of these big trees, several of which are more than 20 feet in diameter and nearly 300 feet high, while some have base diameters between 25 and 37 feet. The largest, known as the General Sherman tree, is 36.5 feet in diameter at the base and 272.4 feet in height, as high as a twenty-seven-story building. Many of the trees are between 3,000 and 4,000 years old. They were young trees before the Pyramids were built in Egypt, and thousands of them were flourishing trees when Christ was born in Bethlehem.

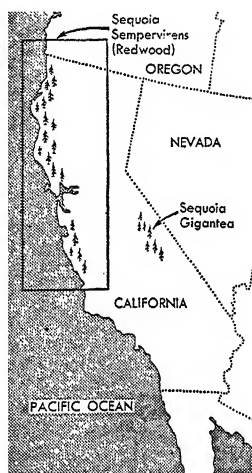
Sequoia National Park is located on the western slopes of the Sierra Nevada in central California, about 220 miles north of Los Angeles. The park includes 601.70 square miles of land, most of which is mountain wilderness. There is a difference in altitude of over two miles from the lowest point in the park to the highest mountain peak. From the top of Mount Whitney (14,496 feet), which is the highest peak in the United States, the visitor can look 100 miles to the east to the mountains around Death Valley, which contains the lowest point of land in the United States.

In the park are 600 miles of trails and 60 miles of roads. Mountain streams and lakes offer fine trout fishing. The magnificent Kern River Canyon, Crystal Cave, and rugged crags of the Sierras attract thousands of visitors each year. The park is always open and is popular for winter sports.

Sequoia National Park was established on September 25, 1890, and was the second national park created. Yellowstone National Park, the oldest, was set aside eighteen years earlier. It was largely through the efforts of George W. Stewart that the giant sequoia trees were saved from the lumber mills.

H.E.

See also UNITED STATES OF AMERICA (color plate, Mighty Forests, Caverns, and Canyons [California]).



Where the Big Trees Grow

**SEQUOYA**, or **SEQUOYAH** (1770?-1843), was a Cherokee Indian who invented the Cherokee system of writing. He was a leader in the affairs of his tribe and is considered one of the most intelligent Indians in history. The sequoia trees of California are named after him, as well as the Sequoia National Park in that state.

Sequoya was born in Taskigi, Tenn., the son of a Cherokee woman and a German trader named Nathaniel Gist. Shortly after the child was born the trader left the mother. Sequoya's English name was George Guess, which came from his father's name, Gist. The word *Sequoya* means *guessed it*.

The boy grew up among the Cherokees in Tennessee without knowing any English. Later he met many white people and became interested in the way they could write out their ideas. Sequoya determined to invent a system of writing for his own people. He completed his system in 1821 after twelve years of work. With it the Indians were able to publish newspapers and books in their own language. Soon afterward Sequoya moved to the Indian Territory in Oklahoma. In 1828 he went to Washington, D.C., as a representative of the western tribes.

J.G.N.

See also **STATUARY HALL**.

**SERAGLIO**, see *RAL yoh*, or *seh RAHL yoh*, is the name of the ancient home of the Turkish sultan at Istanbul (formerly Constantinople). The name seraglio comes from the Persian word *serai*, which means *old palace*. The Seraglio stands on a finger of land which sticks out into the sea. About nine miles of walls surround the palace. In early days, the walls enclosed many temples, the Museum of Constantinople; the harem, and many large public buildings.

The Turkish sultan has not occupied the palace since 1839, and the building has fallen into ruin. The word *seraglio* now means a *harem*, or group of women's apartments in a Moslem house. See also **SULTAN**. M.F.L.

**SERAJEVO**, *SEH rah yeh voh*, or **SARAJEVO**. See **SARAJEVO**.

**SERAPE**, *seh RAH pay*. See **DRESS** (Latin America); **MEXICO** (illustration; Mexicans at Play).

**SERAPEUM**, *SAIR ah PE um*, is the name of a place, building, or group of buildings sacred to Serapis, the ancient Egyptian god. The most famous serapea were at Memphis and Alexandria.

**SERAPHIM**, *SAIR ah fim*. See **CHERUB**.

**SERAPIS**, see *RA pis*. See **JONES**, **JOHN PAUL**.

**SERAPIS** was the name of an Egyptian god. His name is made from the names of *Osiris* and *Apis*. The Egyptians themselves did not worship him, but Greeks and Romans in Egypt did. He was a god of healing and a protector of sailors. Many pilgrims came to worship a holy statue of Serapis in a temple in Memphis. P.CO.L.

**SERBIA**, *SUR bih ah*. The small state of Serbia was formerly an independent state around which present-day Yugoslavia was formed, following World War I. Wars with great neighboring powers have brought suffering to many generations of Serbians.

**The Land.** Serbia covers an area of 42,098 square miles. It lies in the northwestern part of the Balkan Peninsula. The Morava River flows north through the fertile Serbian hills and empties into the Danube. The Vardar River flows through Serbia into the Gulf of

Salonica. A chain of mountains rises in western Serbia.

**The People and Their Work.** Most Serbians are Slavs who believe in the Greek Orthodox faith. Some of the people are Moslems. Groups of gypsies and Greeks live in the southern regions of Old Serbia. Most of the Serbian land is used for agriculture. Almost all farms are small. Corn is the most important food of the people. Serbian plums are in great demand in the markets of Europe.

**History and Government.** As early as 15 B.C., Serbians lived in the Roman province of Moesia. After the barbarian invasions, the province was occupied by tribes of Huns, Ostrogoths, and Avars. In A.D. 637 the Serbs settled in the territory which is now the northwestern corner of the Balkan Peninsula. Serbian regions include



Location Map of Serbia as It Was in 1914

Old Serbia, Bosnia, Herzegovina, Montenegro, and northwestern Macedonia.

The first Serbian kingdom rose in 1168 under the reign of Stephan Nemanya. Serbia became a great empire in the 1300's under the reign of Tsar Stephan Dushan. He led the country in successful wars against the Byzantine Empire. But in 1389 the Serbian Empire was destroyed after the disastrous Battle of Kosovo with Turkey. The Turks ruled Serbia for almost 500 years. After the Russo-Turkish War in 1877, Serbia again became a kingdom.

In 1908 Austria seized the Serbian-speaking province of Bosnia-Herzegovina. This act caused a diplomatic crisis. The spark that set off the war was struck at Sarajevo in Bosnia when Serbian students assassinated the Austrian Archduke Francis Ferdinand. Austria-Hungary declared war on Serbia on July 24, 1914. Serbian armies were crushed by the troops of the Central Powers. After three years of enemy occupation, Serbia regained its freedom in November, 1918. But the Serbian people had suffered heavily.

In December, 1918, Serbia became part of the new kingdom of Serbs, Croats, and Slovenes. In 1929 this new country became the kingdom of Yugoslavia. During World War II, Yugoslavia fell to the Axis powers. But Serbian resistance continued until the Allied victory. In 1945 Yugoslavia declared itself a republic. The new republic included the territory of Serbia. B.W.W.

See also **DRESS** (Yugoslavia; color plate, Europe); **PETER I**; **SLAV**; **YUGOSLAVIA**.



**SERBO-CROATIAN**, *kroh A shun*, **LANGUAGE**. See YUGOSLAVIA (The People).

**SERBS, CROATS, AND SLOVENES, KINGDOM OF THE**. See YUGOSLAVIA.

**SEREDY**, *SER eh dih*, **KATE** ( ? - ), wrote and illustrated *The White Stag*, which won the Newbery medal in 1938. In this book she retold the legend of Atila who, guided by the White Stag, led his people into their promised land and founded the Hungarian nation. She had often heard this story as a child from her father, a schoolteacher in Budapest, Hungary.

Kate Seredy's first ambition was to be a painter. She attended the Academy of Art in Budapest and studied in Italy, France, and Germany. During World War I she was a nurse. Later she illustrated a number of books in Hungary, but she was unknown in the United States when she arrived in 1922. Twelve years after coming to the United States, she wrote and illustrated *The Good Master*, a story of life on a Hungarian farm.



Kate Seredy, author of tales of Hungary for young people

F.C.

See also **NEWBERY MEDAL**.

**Her Works**, which she both wrote and illustrated, include *The Singing Tree*; *Tree for Peter*; *Open Gate*; and *Who Is Johnny?*, a translation from the Hungarian.

**SERENADE**, *sair eh NAYD*, is a type of music, or the act of presenting such music, in the open air at night. It is usually an act of gallantry performed under a lady's window.

**SERF**. The class of peasant farmers known as serfs rose throughout Europe during the Middle Ages. The term serf comes from the Latin word *servus*, which means *slave*. The status of a serf was midway between that of a freeman and a slave. The serf was a bondsman, generally bound to the soil, and required to provide certain payments and services to his master. In these respects he was not free. But by custom, the serf enjoyed certain rights of which he could not be justly deprived. In this sense he was not a slave.

A serf's holdings usually included a house, the adjoining plot of ground, a share of surrounding fields, and a few animals. Part of his crop went to the master of the manor as rent payment. In addition, the serf worked on the lord's land, and contributed special payments from time to time.

The institution of serfdom is usually connected with the manorial economy of medieval Europe, although it existed elsewhere under corresponding conditions. In the later Middle Ages, the rise of towns weakened the manorial system, and caused the gradual decline of serfdom. Many serfs escaped to towns. Others rose in revolt against the tyranny of the lords. In some cases, landlords found it more profitable to hire the farm labor they needed than to make use of the services of the serfs. In such cases the serfs were released. Other serfs began to sell their holdings and leave the estates. In time, their

liberty was recognized by law. English law declared the end of serfdom in the 1600's. Few serfs were left in France in 1789, the year when the French Revolution began. But there were serfs in Russia and Prussia until the 1800's.

W.F.McD.

See also **FEUDALISM** (with list).

**SERGE** is a fabric made from wool, rayon, cotton, or silk. It has a twill weave, which appears as diagonal or slanting ribs or lines on the surface of the material. Worsted serge is used in making dresses, suits, coats, and caps. Silk serge is largely used for linings. Serge comes in widths of 44, 50, 54, and 60 inches.

G.G.De.

**SERGEANT**, *SAHR jent*, is a noncommissioned officer in an army. A sergeant ranks next in grade above a corporal. A sergeant in the United States Army usually has from twelve to thirty-six enlisted men under his charge. The base pay of a sergeant is \$100 a month. A sergeant may attain his grade because of his technical skill in some branches of the army. He is assigned to special tasks without being responsible for the men of lower grade working with him. Such men are known as *technical sergeants*. A *staff sergeant* is one grade above a sergeant. A *master sergeant* may act as a regimental sergeant-major, the highest noncommissioned grade in the army. In this capacity he serves as the chief clerk for the regiment.

E.Co.

**SERGEANT AT ARMS** is an officer who keeps order during the meetings of legislative bodies. He also serves legal papers for the assembly. He has the power to compel members to attend sessions of the legislature when their presence is necessary to make a quorum.

Each branch of the United States Congress has a sergeant at arms. When the sergeant at arms carries the mace down the aisle of the legislature, all disorder must cease. Any member who continues to be disorderly is guilty of contempt. In Great Britain and Canada, the duties of the sergeant at arms are much the same as those in the United States.

Historians believe that the office of sergeant at arms was created by Richard I of England, when the king appointed a corps of twenty-four private bodyguards to attend him and guard his person.

G.E.M.

See also **MACE**.

**SERIES MOTOR**. See **ELECTRIC MOTOR** (Kinds of Electric Motors).

**SERINAGUR**, or **SRINAGAR**. See **INDIA** (Cities [Srinagar]).

**SERKIN**, *SAIR kin*, **RUDOLF** (1903- ), became one of the best-known of modern pianists. He was born at Eger, Bohemia (now in Czechoslovakia), of Russian parents. When Serkin was nine years old, he went to Vienna to study piano and musical theory at the New Conservatory. He made his debut at the age of twelve. Serkin began an active career as a concert pianist in Berlin in 1920, and then joined the violinist, Adolf Busch, in sonata recitals throughout Europe. Serkin left Germany in 1933 and later spent most of his time in the United States. Serkin's first appearance in America was in a concert with Busch in Washington, D.C., in 1935.

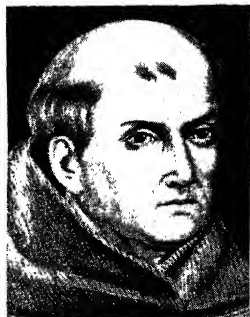
F.B.

**SEROUS**, *SEER us*, **MEMBRANE**. See **MEMBRANE**.

**SERPENT**, another name of snake. See **SNAKE**.

**SERPENTINE**, *SUR pen teen*. See **ASBESTOS**.

**SERRA, JUNÍPERO** (1713-1784), was a Franciscan missionary. He was born in Petra, Majorca, and joined



Cause of Padre Serra

**Father Junípero Serra** was an early missionary to the Indians of California.

the San Fernando missionary college in Mexico in 1749. Serra became famous as a preacher, and made long journeys on foot in spite of lameness. In 1767 he became the superior of the Franciscan missions in Lower California. He founded the first mission in Upper California in 1769. Serra's writings include the *Representación*, drawn up by the order of the viceroy, and a *Diario*.

F.J.S.

See also STATUARY HALL.

**SERTORIUS**, *ser* **TOH-rih us**, **QUINTUS** (d. 72 B.C.). See POMPEY THE GREAT.

**SERUM**, *SEER um*, is the liquid part of the blood. It is straw-colored and watery, and carries the red corpuscles which give the blood its color. Various diseases were formerly treated by injections of serum, because it often contains substances which the body forms to fight disease. Refined antitoxins made from serum are now used. Their advantage is that they do not cause serum sickness, which used to be common.

Preparations made from serums are used to treat some diseases, such as scarlet fever, diphtheria, and lockjaw, after they have started. Other serum drugs keep a person from getting the disease after he has been exposed to it.

Serums that neutralize the poisons formed in the body by disease germs are called *antitoxic*. The most successful serums of this type are those which control diphtheria, lockjaw, erysipelas, scarlet fever, and snakebite. Another type of serum, which kills microbes, is called *antibacterial*. The most successful of this type treat spinal meningitis, one type of pneumonia, anthrax, and dysentery.

Many preparations for treating and preventing diseases are made from animal serums. Human serum from convalescents is also used, especially for measles and scarlet fever.

In preparing antitoxic serums, the microbes that cause the disease are grown in a special fluid. The fluid is then strained through a porcelain filter. The filtrate contains the toxins, or poisons, produced by the microbes. It is then injected beneath the skin of a large animal, such as a horse. A series of inoculations are given, each dose stronger than the preceding one. The animal gradually builds up large amounts of antitoxins or antibodies, in its blood, to resist the poisons. At the proper time the animal is bled. Straining serum through a filter separates it from the blood corpuscles. If tests show that it is suitable, it is used to inoculate human beings.

It is common practice to call any injection a serum injection. But a vaccine is not the same as a serum. A vaccine is prepared from dead bacteria, while a serum comes from the blood.

W.W.B.

See also ANTITOXIN; CENTRIFUGE; IMMUNITY.

**SERUM ALBUMIN**. See ALBUMIN.

**SERVAL**, *SUR val*. The serval is a large wildcat that lives in Africa, from the Cape of Good Hope north to

Senegal and the Sudan. It is very common in south-central Africa. Its tawny, black-spotted fur is sold under the trade name of *tiger cat*. The male is between 3 and 4 feet long, and stands 18 to 23 inches tall at the shoulders. It has a 12-inch tail and rather large ears. Native African chiefs wear mantles, or collars, made of serval fur, and, as a result, the serval is in danger of being killed off. These animals are easy to tame if they are captured when young, but they are difficult to raise. They are usually taken in snares or are pursued and treed by dogs. The serval hides in thick bushes along riverbanks, waiting for its prey. It eats small mammals, fowl, and other creatures up to the size of small antelopes. It generally hunts on the ground, but is an expert climber and often



New York Zoological Society

The serval has a head much like that of the domestic cat. The body markings are a combination of dots and stripes.

goes into the trees after roosting birds and other prey. See also CAT.

V.H.C.

**Classification**. The serval belongs to the family *Felidae*. Its scientific name is *Felis serval*.

**SERVETUS**, *ser VEE tus*, **MICHAEL** (1511-1553), was a Spanish physician and theologian. He is remembered not only as one of the martyrs of science, but also as a forerunner of the English physician, William Harvey, in his studies of the circulation of the blood. Servetus' description of the pulmonary circulation is now considered a classic passage in physiology.

He was born at Tudela, in Navarre, Spain, and studied medicine in Paris. He lectured in Paris on geometry and astrology, and then practiced medicine in various French cities. John Calvin as well as the Roman Catholics condemned Servetus for not conforming with accepted doctrines in his writings on religion. Calvin had him arrested at Geneva as a heretic, and he was burnt at the stake.

V.R.

See also CALVIN, JOHN.

**SERVIA**, *SUR vîh ah*, or **SERBIA**. See **SERBIA**.

**SERVICE, ROBERT WILLIAM** (1874- ), is the Canadian poet and novelist who wrote "The Shooting of Dan McGrew" and other stirring ballads of life in the Yukon.



Robert Service is noted for his ballads of the great American Northwest.

He has been called the Canadian Kipling, but in many ways his work is more like that of the American author Bret Harte. The poems and stories of both writers deal with the rough life of the miner, the hunter, and the trapper in frontier days.

Service was born in Preston, England, and was educated in Glasgow, Scotland, where he became a bank clerk. In 1905 he moved to Canada and started farming on Vancouver Island. During this time, he took long trips along the Pacific Coast and through the Yukon. Later he worked for the Canadian Bank of Commerce, which sent him to White Horse and Dawson City. But he resigned to spend all his time writing.

W.S.W.

His works include *The Spell of the Yukon*; *Songs of a Sourdough*; *Ballads of a Cheechako*; *Rhymes of a Red Cross Man*; *The Pretender*; *The Trail of '98*; and his autobiography, *Ploughman of the Moon*.

**SERVICE CROSS, DISTINGUISHED.** See **DECORATIONS AND MEDALS** (Decorations of the United States).

**SERVICE MEDAL, DISTINGUISHED.** See **DECORATIONS AND MEDALS** (Decorations of the United States).

**SERVICEMEN'S READJUSTMENT ACT OF 1944.** See **G.I. BILL OF RIGHTS**.

**SERVICE ORGANIZATIONS, UNITED.** See **UNITED SERVICE ORGANIZATIONS**.

**SERVING.** See **HOME ECONOMICS** (Home Management [Food]).

**SERVITES, SUR vîtes, ORDER OF.** See **RELIGIOUS ORDERS**.

**SERVIVS TULLIVS** (reigned 578-534 B.C.) was the sixth of the seven legendary kings of early Rome. He was said to be the son of a god and the queen's slave Ocrisia, and was adopted by King Tarquinius Priscus. ServivS became such a favorite of the king that he married the king's daughter and was named heir to the throne. ServivS is believed to have begun most of the civil rights and institutions of Rome. ServivS was also said to have passed a law which made the poor people, or plebeians, as well as the nobles, subject to taxes and military service. This law was the first to recognize the plebeians as being of value to the state. After forty-four years of rule, ServivS was murdered by his daughter and son-in-law. See also **PATRICIAN**; **PLEBEIAN**.

W.S.F.

**SESAME**, *SES ah mee*, is an herb grown in the tropical countries. It is grown mainly for the oil obtained from its seeds. This plant was originally grown in China, India, and Japan, and has been cultivated in Mexico and in the southern part of the United States. The plant is an annual, and grows to a height of about two feet.

Its leaves are oblong. It has tiny flowers that may be pink or white, depending upon the species. Small cases, called *capsules*, contain many small, flat seeds that range from white to brown in color.

The oil obtained from sesame seeds is straw colored and is similar to olive oil. It is used in salad dressings and in cooking. The seeds themselves have a delicious taste and are used to flavor bread, biscuits, and candy. H.N.M.

**Classification.** The sesame plant belongs to the family *Pedaliaceae*. The species is *Sesamum indicum*.

**SESAMOID.** *SES ah moyd*. See **KNEECAP**.

**SESQUI-CENTENNIAL, SES kwîh sen TEN ih al, EXPOSITION.** See **CENTENNIAL EXPOSITION** (Sesqui-centennial Exposition).

**SESTET, ses TET, or SES tet.** See **SONNET**.

**SET** was the god of evil in Egyptian mythology. He was the brother of Osiris, who stood for goodness, and there was constant warfare between them. At first Set represented physical evil. Later he came to be the symbol of evil of all kinds. Set is shown as a monster with the body of an ass, the ears and snout of a jackal, and the tail of a lion.

S.M.S.

**SETH.** See **ADAM AND EVE**.

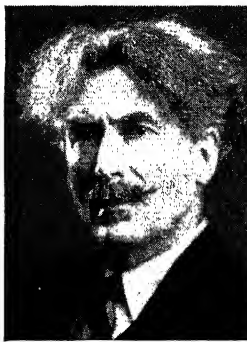
**SETI I, SEH tee** (reigned about 1313-1301 B.C.), was an ancient king of Egypt. Early in his reign he conducted two campaigns in Syria. There he checked the southward expansion of the Hittites and re-established Egyptian rule over Palestine and southern Phoenicia. Seti also built several large temples, and began the magnificent Hall of Columns at Karnak, which was later completed by his famous son, Rameses II. His splendid tomb was discovered in the Valley of the Tombs of the Kings in 1817, and his mummy, together with that of Rameses II, was found at Deir el Bahri, near Thebes, in 1881.

A.E.R.B.

**SETON, ELIZABETH ANN BAYLEY** (1774-1821), was founder and first superior of the Sisters of Charity in the United States. She was the daughter of Richard Bayley, and married William Magee Seton in 1794. Elizabeth Ann was left a widow in 1803 with five children. She became a convert to the Catholic Church in

1805, and went to Baltimore to open a school for girls. There she founded a new community, and was elected superior. The community was modeled on the Sisters of Charity of St. Vincent de Paul. Mother Seton and eighteen sisters made their vows in 1813.

F.J.S.



Ernest Thompson Seton, American nature writer

**SETON, ERNEST THOMPSON** (1860-1946), was a writer of nature books for boys. His name is often associated with the Boy Scouts of America and the Woodcraft Indians. He wrote the first handbooks for these organizations. Seton's real name was Ernest Seton Thompson, but when he began to write he changed his name.

Seton was born in South Shields, England, but spent

his early boyhood in Canada. He was educated at the Toronto Collegiate Institute and at the Royal Academy in London. Between 1890 and 1896 Seton studied art in Paris, and afterward settled in New Jersey.

Seton believed that the average boy needed to know something about outdoor life in order to become a good citizen, and in 1901 he organized the Woodcraft Indians. Nine years later he helped found the Boy Scouts of America. Seton was Chief Scout of the new organization until 1915.

C.M.E.

See also WOODCRAFT LEAGUE OF AMERICA.

**His Works** include *Wild Animals I Have Known*; *The Biography of a Grizzly*; *Two Little Savages*; *Wild Animals at Home*; and *Gospel of the Redman*.

**SETON HALL COLLEGE** is a Catholic liberal arts school for men in South Orange, N.J. There is a co-educational Urban Division in Newark and Jersey City, N.J., with schools of arts and sciences, education, business administration, and nursing education. The college was founded in 1856 and has an average enrollment of about 2,500.

W.F.F.

**SETON HILL COLLEGE** is a Catholic liberal arts school for women in Greensburg, Pa. Seton Hill was founded in 1883, and has an average enrollment of about 1,500 students.

**SETTER.** A setter is a long-haired hunting dog used to hunt birds, such as quail, partridge, or grouse. There are three breeds in the setter family. The *English setter* is usually white with black, orange, or tan patches. The

*Irish setter* is always mahogany red. The *Gordon setter* is always black with small tan markings on its head, feet, chest, and tail. All three of the setter breeds have beautiful, silky coats, expressive eyes, and heavy muzzles. They make keen, intelligent companions and are extremely gentle.

The setter was developed from the old "setting spaniel." Setters are about the same size and shape as pointers, but have the spaniel's long hair. This hair is feathery about the ears, tail, legs, chest, and belly.

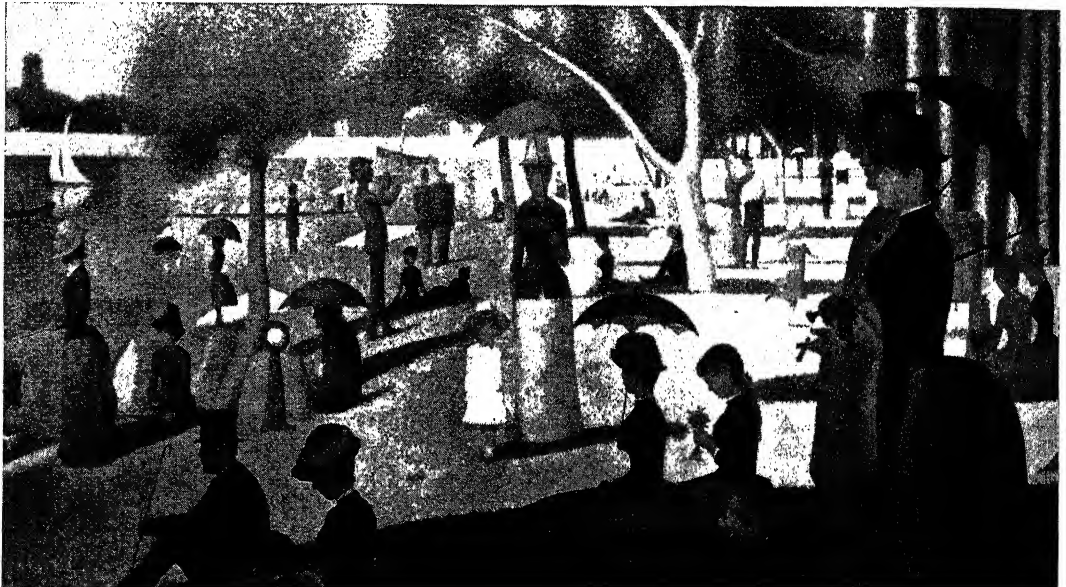
Setters hunt the same way pointers do, ranging the field until they smell the game near by. Then they come to a "point" with body rigid, tail out straight, and sometimes with one front paw lifted off the ground. They hold this position until the hunter comes up, "flushes" the game to make it fly into the air, and shoots. With the shot, the setter goes into the grass or bushes and brings back the game.

S.E.M., Jr.

See also DOG (color plate, Sporting Dogs).

**SETTLEMENT, SOCIAL.** See SOCIAL SETTLEMENT. **SETÚBAL.** See PORTUGAL (Cities).

**SEURAT, suh RAH, GEORGES** (1859-1891), was one of the greatest of modern French painters. He originated a style of using dots and dashes of unmixed color called *pointillism*. This style later developed into the Neo-impressionist or Divisionist school of painting. Seurat is also noted for his scientific method of regarding the canvas as an architectural structure, and the figures and other forms as parts to be built into this structure.



"Sunday on the Grande Jatte" by Georges Seurat shows in full effect this French artist's original style. Instead of painting

with bold strokes, Seurat built up his pictures by making thousands of tiny dots and dashes of color.

Art Institute of Chicago

Seurat was born in Paris and began to study art at the age of seventeen. At nineteen he entered the École des Beaux Arts.

M.C.C.

**His Works** include "Sunday on the Grande Jatte" in the Chicago Art Institute; and "The Circus" in the Louvre Museum, Paris.

**SEVASTOPOL.** See CRIMEA; UNION OF SOVIET SOCIALIST REPUBLICS (Cities).

**SEVEN CITIES OF CIBOLA.** See CIBOLA, SEVEN CITIES OF.

**SEVEN DAYS' BATTLES.** See WAR BETWEEN THE STATES (Principal Battles [Malvern Hill]).

**SEVEN SLEEPERS OF EPHEBUS** were the seven Christian youths in an old legend who were said to have fled to the mountains near Ephesus in Asia Minor to escape the persecution of the Emperor Decius in about A.D. 251. Pursuers discovered their hiding place and blocked the entrance. Two hundred years later, a shepherd stumbled upon the cave and discovered seven youths asleep. When he awakened them, they believed that only a night had passed, and one of them went to Ephesus for food. According to the story, the youth offered to pay for the food with coins 200 years old and was arrested as a thief of hidden treasure. But Emperor Theodosius II believed a miracle had taken place, and led the youth in a triumphant procession to the cave. Later he had a great church and graveyard built to mark the spot. The seven sleepers lived for only a short time. All died at the same moment, and were buried where they had slept.

In 1928 Franz Miltner, an Austrian archaeologist, found near Ephesus a tomb which shows that the tale of the Seven Sleepers has some basis of fact. The ancient church built by Theodosius had been covered by other churches, and was discovered only by accident. The legend of the Seven Sleepers began in Syria and appeared in European literature in the A.D. 500's. The subject was a favorite theme in the art of the Middle Ages. Mohammed apparently accepted the legend as true for it is told in the Koran, the Moslem bible. H.A.M.V.

**SEVENTEEN-YEAR LOCUST** is the popular name for one of the cicadas which does not become an adult for about seventeen years after the egg is hatched and the resulting nymph has burrowed into the ground. It is described in the articles CICADA and LOCUST. G.P.

**Classification.** The seventeen-year locust is *Cicada septendecim* in the *Cicadidae* family, order *Homoptera*.

**SEVENTH-DAY ADVENTIST.** See ADVENTIST.

**SEVENTY YEARS' CAPTIVITY.** See POPE (Troubles of the Papacy).

**SEVEN WEEKS' WAR.** Prussia and Austria fought the Seven Weeks' War during the summer of 1866. It was engineered by Prince Otto von Bismarck, prime minister of Prussia. The war was part of Bismarck's campaign to unite all Germany under the leadership of Prussia, and to expel Austria from the German Confederation.

A dispute over the Danish duchies of Schleswig and Holstein was the immediate cause of the war. Bismarck ordered Prussian troops into Holstein, which was controlled by Austria. Prussia was supported by the North German states, and Austria by the southern states. Bismarck had also secured the aid of Italy, and lured France into neutrality by promises of territory in case

Prussia should win. The Prussians, under General Helmuth von Moltke, won victory after victory. After the great Battle of Sadowa on July 3, 1866, Prussia dictated the terms of peace.

The peace treaty was signed at Prague (now Praha) the following month. The Treaty of Prague dissolved the old German Confederation. Schleswig-Holstein was annexed to Prussia. Austria was excluded from German affairs, and Venetia was given to Italy. A North German Confederation was established under the leadership of Prussia.

J.S.S.

See also BISMARCK-SCHÖNHAUSEN; GERMANY (The Rise of Prussia through the Unification of Germany); MOLTKE, HELMUTH, COUNT VON; SAXONY; SCHLESWIG-HOLSTEIN.

**SEVEN WISE MEN OF GREECE** is the name scholars give to various sages who lived in Greece and Asia Minor about 600 B.C. Plato and other Greek philosophers listed the names of the wise men, but not all accounts agree. The usual list of sages is Bias, Chilon, Cleobulus, Periander, Pittacus, Solon, and Thales. The wise men were active in science and affairs of state. See also EPIMENIDES; SOLON; THALES.

C.B.W.

**SEVEN WONDERS OF THE ANCIENT WORLD.** There were seven works of art which the people of ancient times considered the most wonderful in the world because of their beauty or size. Antipater of Sidon listed the works in the 100's B.C. He made his list from the Greek guidebooks used by the sight-seers of the period. Another slightly different list has been wrongly credited to Philo of Byzantium. The seven wonders of the ancient world were as follows:

**Pyramids of Egypt.** See PYRAMIDS.

**Hanging Gardens of Babylon.** This was a group of five gardens built in the form of a square. The gardens rose in a series of terraces to a height of about seventy-five feet. Each garden was arranged like an amphitheater and contained trees, shrubs, and flowers of many kinds. It is believed that Nebuchadnezzar ordered the garden built to honor his wife, who missed her mountain home.

**Statue of Jupiter, or Zeus, at Olympia,** by Phidias (400's B.C.). This was a huge figure in gold and ivory, which showed the god seated on a throne. See PHIDIAS.

**Temple of Diana, at Ephesus.** See DIANA.

**Mausoleum, at Halicarnassus.** This was a magnificent burial place built by Queen Artemisia in 353 B.C. in memory of her husband, Mausolus. The word *mausoleum* comes from his name. Halicarnassus was an ancient Greek city in Caria, on the southwest coast of Asia Minor. In the 1800's British scientists found valuable pieces of architecture and sculpture at the site.

**Colossus of Rhodes** was a bronze statue representing Helios, the sun god. It is said to have stood at the entrance of the harbor of Rhodes, straddling the harbor entrance, so that the ships sailed between its legs. It was finally destroyed by an earthquake.

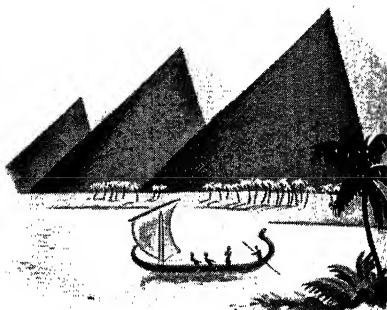
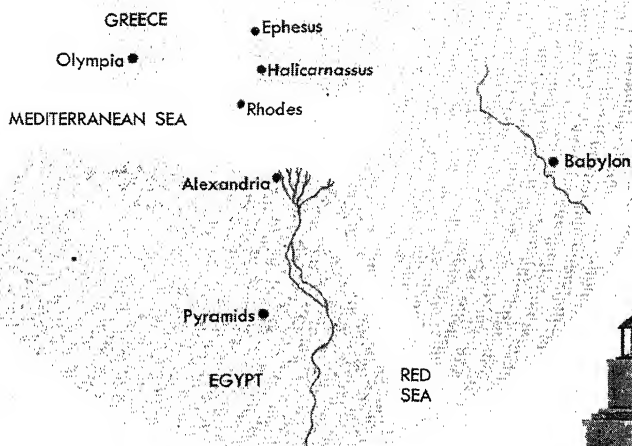
**Pharos.** This was a lighthouse built on an island in the Bay of Alexandria, by Ptolemy II (309-246 B.C.). The lighthouse was nearly 400 feet high and rested on a base 100 feet square. An earthquake destroyed it in the A.D. 1300's.

H.MCP.D.

**Modern Wonders.** Many persons have tried to make up a list of wonders of the modern world which would correspond to the list of wonders of the ancient world. Sometimes they have listed natural wonders, such as the Carlsbad Caverns or Victoria Falls. In other cases, they have tried to make lists of the wonders brought about



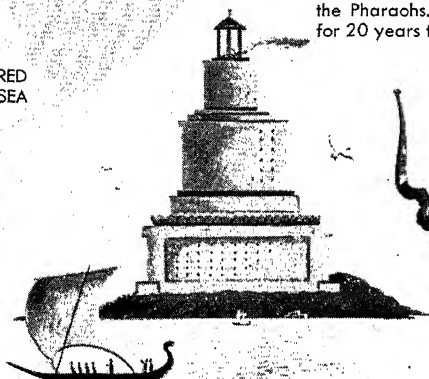
# SEVEN WONDERS OF THE ANCIENT WORLD



**The Pyramids of Egypt** provided tombs for the Pharaohs. It took the labor of 100,000 for 20 years to build the Great Pyramid of



**The Hanging Gardens of Babylon** bloomed as a living green miracle in a desert city.



**The Pharos Lighthouse** towered 400 feet high. Its beacon guided seamen for some 1,500 years.



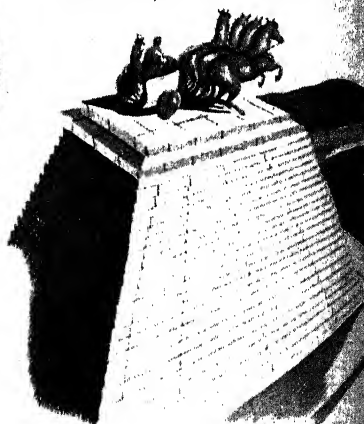
**The Colossus of Rhodes** straddled the harbor entrance. Its height of 105 feet allowed ships to sail between its legs.



**The Statue of Zeus** had fiery precious stones for eyes, which made it seem a living god to the ancient Greeks. Fire destroyed its beauty in A.D. 476.

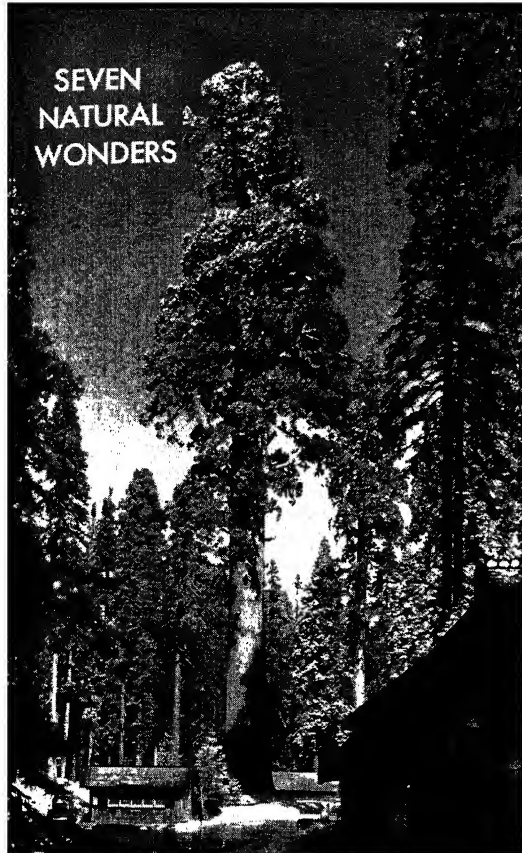


**The Temple of Diana** at Ephesus covered nearly two acres. About 100 graceful sixty-foot columns held up its gently sloping roof.



**The Mausoleum at Halicarnassus** honored the memory of a wise king. Statues and carvings told of his reign.

**SEVEN  
NATURAL  
WONDERS**



**Giant Sequoia Tree of California**



**Rainbow Natural Bridge of Utah**



**Yellowstone Falls, Yellowstone National Park**



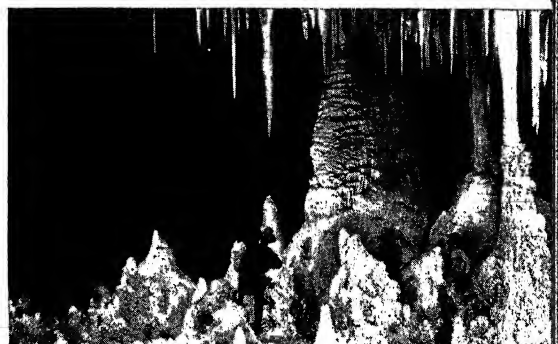
**Vishnu Temple of the Grand Canyon, Arizona**



**Crater Lake and Wizard Island, Oregon**



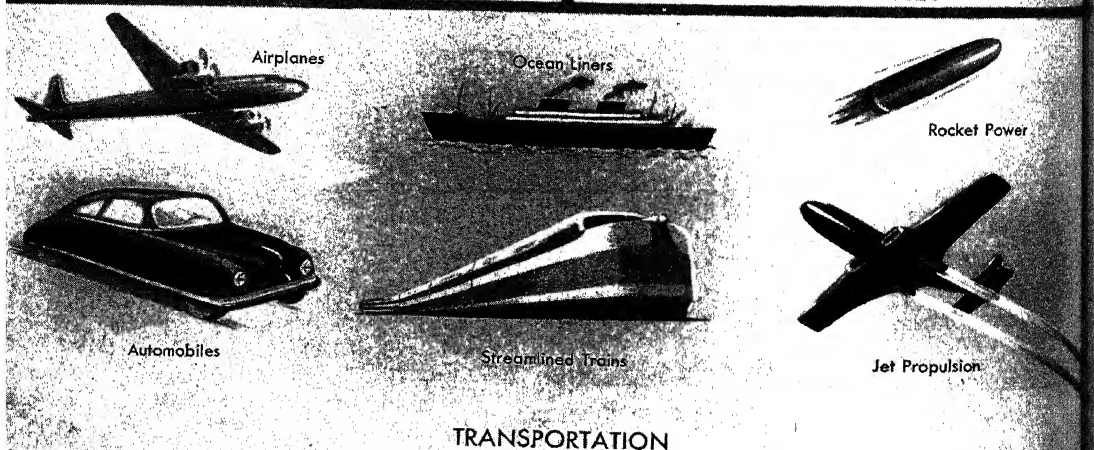
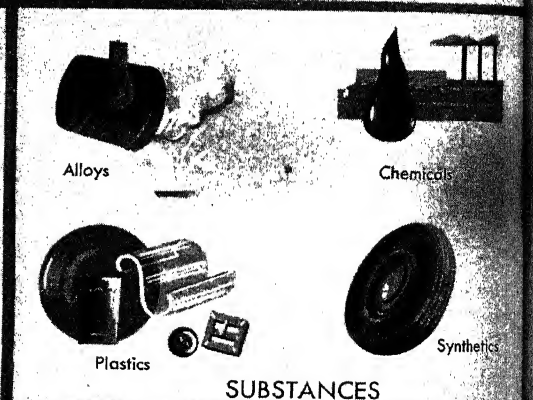
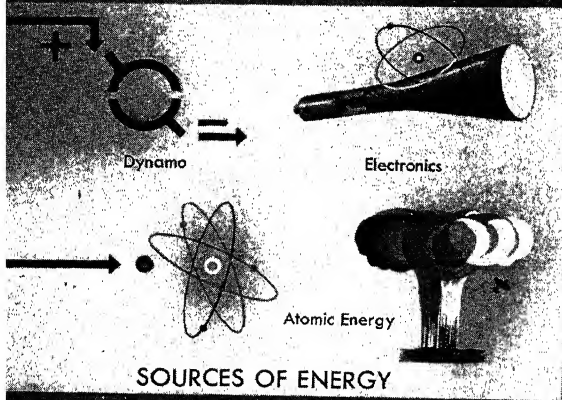
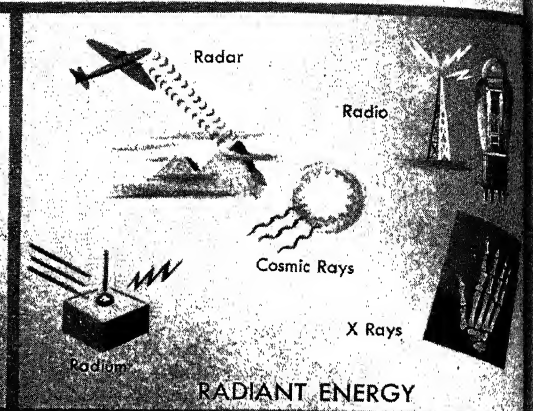
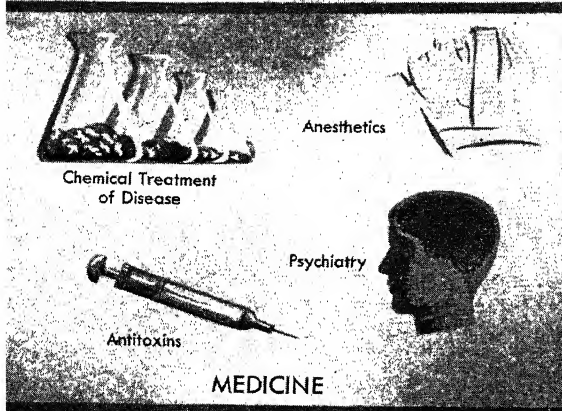
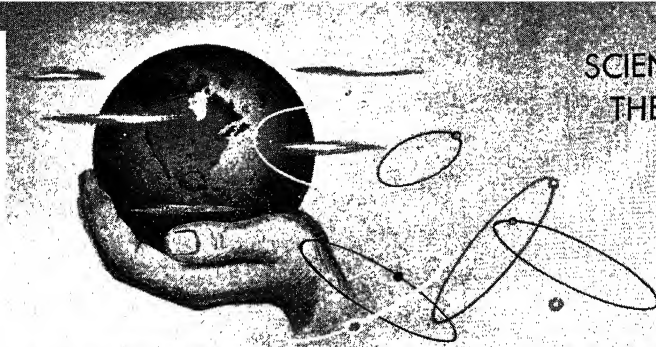
**Victoria Falls of the Zambesi River, South Africa**



**Carlsbad Caverns of New Mexico**

Photos: Josef Muench; Gendreau

# SCIENTIFIC WONDERS OF THE MODERN WORLD



by man's ability to build and discover. Such lists must be constantly changing, for man builds even larger dams, larger airplanes, and taller skyscrapers. He discovers new facts about nature, and extends his control over his environment. Men not yet old have seen the coming of the automobile and the airplane, of electronics, and the liberating of the energy in the nucleus of the atom.

**SEVEN YEARS' WAR** (1756-1763). This war involved nearly every nation in Europe, and extended to America and India. In America it was called the French and Indian War.

The chief cause of the Seven Years' War was a quarrel between Frederick the Great, King of Prussia, and Maria Theresa, Archduchess of Austria, over the possession of Silesia. Frederick had taken away Silesia from Austria, but Maria Theresa never gave up hope of regaining her lost province. She allied herself with Czarina Elizabeth of Russia, who bitterly hated and feared the Prussian king. Maria Theresa found it more difficult to make an alliance with France, the ancient enemy of Austria. But she finally succeeded with the aid of her shrewd foreign minister, Count Wenzel Anton von Kaunitz. The foreign minister was aided in his efforts by a British-Prussian agreement, which angered the French and made them more sympathetic to Austria's cause.

Meanwhile, Frederick the Great was carefully watching the moves of his enemies. He determined to strike the first blow. In October, 1756, he invaded Saxony, which sided with Austria. An Austrian army was sent to defend Saxony, but was quickly defeated by the Prussians. Frederick soon forced the entire Saxon army to surrender, and made himself master of the country.

In spite of these victories, Prussian hopes for victory were dim early in 1757. Sweden had joined Austria and its allies. Almost all of Europe was now united against the Prussian king. Britain was Prussia's only ally, and England gave but little help.

Frederick invaded Bohemia and won a battle near Prague (Praha). He then laid siege to Prague, but was defeated in the battle of Kolin. Frederick was outnumbered, but he moved with great vigor and decision. He attacked and defeated the French in a great battle at Rossbach later in the same year, and then defeated the Austrians at Leuthen.

The beginning of operations in the spring of 1758 found Frederick's position much improved. William Pitt came to power in Britain, and began to give more active aid to Prussia. A new British army was organized, which won several victories over Frederick's enemies. But Frederick's resources were limited, and Prussia had been weakened by his costly campaigns. Prussia neared exhaustion, and its eventual ruin seemed certain.

Frederick reached his most desperate position in 1762. But in that year Elizabeth of Russia died suddenly and was succeeded by Peter III, an enthusiastic admirer of Frederick. He decided to take Russia out of the war, and began arrangements for a separate peace with Prussia. This turn of fate saved Frederick from what looked like complete disaster.

A peace was signed at Hubertsburg early in 1763. Silesia remained under Prussian rule, and other bound-

aries remained as they had been before the war. There were no territorial changes in Europe. The disputes between France, Spain, and Great Britain were settled by the Treaty of Paris on February 10, 1763.

**In America.** One of the most important results of the Seven Years' War took place far from Europe. Britain was finally victorious in its long struggle with France for the control of North America. At the end of the Seven Years' War, France gave up Canada to Britain, and all French dreams of an empire in the New World vanished. J.S.S.

**Related Subjects.** The reader is also referred to:

Frederick (II, Prussia)	Paris, Treaties of
French and Indian Wars	Pitt, William
Kaunitz, Prince von	Pompador, Marquise de
Maria Theresa	Silesia

**SEVERN RIVER.** The Severn is one of the chief waterways of England. It rises in the mountains of Wales and takes a roundabout course through England for 210 miles to the Bristol Channel. Its mouth is several miles wide, and a four-mile tunnel runs under it. Boats can use the Severn up to Welshpool, a town in Wales 180 miles from the river's mouth. Canals connect the Severn with the Trent, Thames, and Mersey rivers. The banks of the Severn are often flooded by great tidal waves which come into its mouth. The chief cities on the banks of the Severn are Gloucester, Worcester, and Shrewsbury. See also BORE. W.R.McC.

**SEVERSKY**, *syeh VYER skuh ih*, **ALEXANDER PROCOFF DE.** See DE SEVERSKY, ALEXANDER PROCOFFIEFF.

**SEVERUS**, *see VEE rus*, **LUCIUS SEPTIMIUS** (A.D. 146-211), was a Roman emperor. He was born near Leptis Magna, Africa, and chose the army as his career. When the Emperor Pertinax was murdered in A.D. 193, Severus' troops proclaimed him emperor. He marched on Rome and put down his rival Julianus, and then defeated two other rivals. He fought the Parthians and then went to Britain, where he built a wall across the island from the Tyne River to the Solway Firth.

Severus based his power openly on the army and reduced the part the Roman Senators played in the government. He also gave the other peoples of the Empire a greater equality with the Italians. In this way he paved the way for the famous edict of his son Caracalla which gave Roman citizenship to most of the freemen of the empire. See also ROMAN WALLS. W.S.F.

**SEVIER**, *see VEER*, **JOHN** (1745-1815), was an American soldier, frontiersman, and politician. He was governor of the "lost state of Franklin," and later became the first governor of Tennessee.

Sevier, the son of a tavern keeper, was born near New Market, Va. He received little education, and as a young man supported himself by farming and trading. Sevier was a restless young man, and never could stay in one place for a very long time. He became a pioneer; and in 1773 moved to the Holston River Valley, a then unsettled region of the colony of North Carolina. It is now in eastern Tennessee. Here he soon became a leader.

Sevier was an active supporter of the Revolutionary cause, but took little part in the fighting until 1780. In that year he led an expedition over the Smoky Mountains and defeated the British at King's Mountain. Later



he led an expedition against the Cherokee Indians. This was the first of many campaigns that brought him fame as an Indian fighter. After the close of the Revolutionary War, the settlers in Tennessee began a movement to make the region a separate state. In 1784 the state of Franklin was organized, and Sevier was elected governor. Indian troubles, land speculation plots, and quarrels with rivals led to Sevier's downfall and the practical end of the state of Franklin in 1788. Sevier's career was blasted and he became an outlaw. But soon after, he was pardoned and elected to the North Carolina Senate. From 1789 to 1791 he served in the Federal Congress.

In 1791 the "lost state of Franklin" became a part of the new state of Tennessee. Sevier was elected its first governor, and served a total of six terms. In 1796 he quarreled with Andrew Jackson, then one of his associates, over a land speculation Sevier had made. This quarrel almost led to bloodshed on several occasions and embittered the rest of Sevier's life. After the end of his sixth term as governor, Sevier was elected to the state Senate for one term and served in Congress until his death. T.R.H.

See also FRANKLIN, STATE OF; STATUARY HALL.

**SEVIER RIVER.** See UTAH (Rivers and Lakes).

**SÉVIGNÉ**, say *VE nyay*, **MADAME DE.** See FRENCH LITERATURE (Golden Age).

**SEVILLE.** See SPAIN (Cities).

**SÈVRES, *SEH ur*, TREATY OF.** At the close of World War I, Turkey and the Allies signed the Treaty of Sèvres at Sèvres, France. The treaty was signed on August 10, 1920, and marked a low point in Turkish power and history. It provided that Syria, Palestine, and Mesopotamia (now Iraq) would be "provisionally recognized as independent states to be advised by mandatory powers." Turkey was to give up all its territorial claims in northern Africa, and to cede eastern Thrace to Greece. Smyrna and the Ionian region were to be under Greek rule for five years. The independence of Armenia was recognized. The waters around Turkey were to be opened to the vessels of all nations, and the Turkish armed forces were to be reduced to a mere police force. Turkish finances were to be controlled by an Allied commission.

This treaty was signed by the Turkish government, but it was never ratified by the Turkish nationalists. The Turkish leader, Kemal Atatürk, overthrew the feeble Ottoman government and set up a new, independent Turkey. Ankara was made the new Turkish capital. Kemal Atatürk's government refused to recognize the treaty signed at Sèvres. Turkish forces finally defeated the Greeks at Ajiun-Karahissar and Brusa, and later drove the Greeks from Smyrna. In 1923 the Turkish government negotiated a new peace treaty with the Allied powers at Lausanne, Switzerland. D.E.L.

See also KEMAL ATATÜRK; LAUSANNE, TREATY OF; SMYRNA.

**SÈVRES PORCELAIN.** See PORCELAIN (Marking on Chinaware).

**SEWAGE, *SOO ij*,** is the waste matter of a community which is carried away by water. A sewage system is a system of pipes and conduits for conveying sewage from houses, factories, and other buildings. Sewers also often drain off either all or part of the rain water which falls

in the streets. For this reason they are often called *drains*. A single system of conduits carrying both sewage and rainfall is called a combined system. Separate rain-water sewers are often called storm sewers. The best system has separate pipes and conduits for rain drainage and sewage. When a combination system is used, sewers sometimes become choked by rain water and the sewage seeps into cellars and basements.

**Sewage Disposal in Cities.** Sewage disposal is extremely important in large, modern cities. The sewage should be deposited at a safe distance from the centers of population. Scientific methods are necessary to protect the community health. Engineers, health departments, and municipal officers are concerned with this problem.

Sewage runs through pipes of different sizes from private homes to public conduits, which are large in diameter. It is conducted through these conduits and discharged a long way from the community, often into streams or into the sea. On farms and in small villages, sewage is often disposed of in the soil, but this practice would be very unsanitary in a thickly populated city.

The house drain is made of glazed stoneware or cast-iron pipe. It discharges the sewage into larger pipes of earthenware or concrete. The larger conduits called *mains*, are made of brickwork or concrete. The ordinary earthenware sewer pipe is salt-glazed with a smooth glossy surface to help the flow. The pipe is made in short lengths with a socket at one end into which the next length of pipe fits. Hemp packing and Portland cement close up the joint.

The large conduits are made of concrete, or of several layers of brick resting on a concrete bed. These conduits may be very large in order to handle the sewage of large neighborhoods. All the pipes of the system are set on the same slant to give a steady flow, which should be at least two and one-half feet a second. When the ground is quite level, the flow is sometimes helped by pumps.

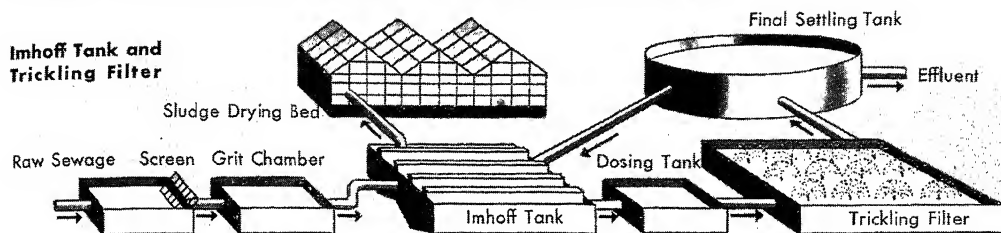
When sewage decomposes it produces poisonous and explosive gases, and so sewers are ventilated to keep the gases from accumulating in the pipes. Shafts with iron gratings are placed at intervals to let air into the conduits. When these gratings are large enough for a man to lower himself through to clean or inspect the sewers, they are called *manholes*. Such manholes are placed at every point where the conduit changes direction. They are also placed at all places where the branches of the system meet.

All the gas formed does not escape through the shafts. Some of it tends to back up through the system into private homes. To prevent this, sinks and washbowls are fitted with an *elbow* in the pipe, which is a bent section that holds enough water to block the fumes. This is called a *trap*.

Cities on the shores of oceans or large lakes usually empty their sewage into the deep water. Rivers are also used. Bad odors can be prevented if the sewage is diluted in water from twenty to forty times its own volume. But there is always danger of typhoid fever if the sewage is not treated chemically before it is emptied into the water. In many huge modern cities so much sewage is dumped into near-by waters that they sometimes become polluted.



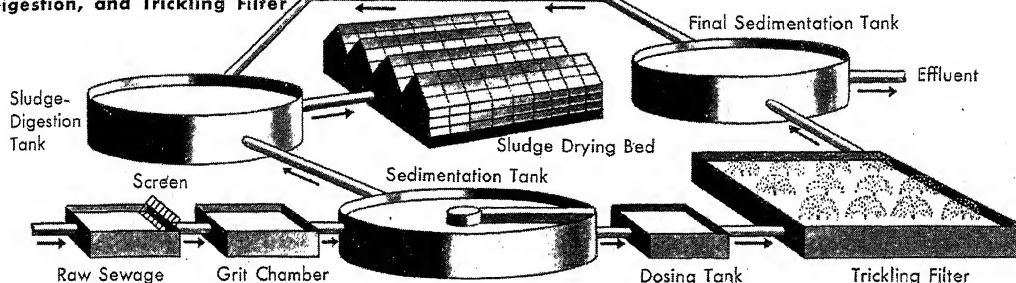
## THREE TYPES OF SEWAGE TREATMENT PLANTS



heavy inorganic material has been screened out, sewage is clarified in the Imhoff sedimentation tank. It is ex-

posed to the action of air in the trickling filter. Matter is removed from water in the settling tank.

### Sedimentation, Separate Sludge Digestion, and Trickling Filter



After screening, organic matter is chemically treated, or "digested." Solid matter sinks to bottoms of series of tanks

after being filtered. Finally the sewage is dried in sludge drying bed. This dry material is removed and trucked away.

### Activated Sludge



### Activated Sludge Return



Raw Sewage → Grit Chamber → Sedimentation → Aeration Tank → Final

This method is widely used by large cities. The action of bacteria and air breaks down the organic matter after it has set-

led through filters into sedimentation expensive but gives excellent results.

his met

In modern sewage disposal, the sewage is often treated with chemicals in huge tanks. Lime, or lime and aluminum or ferrous sulfate, may be used as a purifier. Septic tanks, sand filters, and percolating filters are more common. Bacteria in septic tanks change harmful organic matter into harmless minerals.

Another modern method is the *activated-sludge process*. The sewage is passed through activation tanks which have porous plates or perforated pipes at the bottom. Air is passed through the pipes at low pressure, keeping the sewage stirred up. This "boiling" action keeps the sewage and sludge in suspension. The liquid part of the sewage and some of the sludge are drawn into settling tanks. The liquid is carried from these tanks to some body of water. The sludge is often dried and sold for fertilizer.

The largest activated-sludge plant in the world was opened in Chicago in 1928. The sludge is dried on open

air beds after it has been treated in the settling, sludge-digesting tanks. Then machines dump the dried sludge on land along the Chicago Drainage Canal. New York City has an activated-sludge plant on Ward's Island.

There is a great amount of waste matter, such as ashes and garbage, in a city which can not be disposed of by the sewage system. These waste materials are collected in carts and usually burned at incinerating plants, or dumped where they can do no harm. The more scientific method is to convert much of the waste into grease and other useful materials in a reduction plant.

**Sewage Disposal on Farms.** The chief danger in handling drainage on a farm is that wells and drinking water may be contaminated. Science has solved this problem even better than it has the problem of city sewage disposal, according to some authorities.

In the rural system, a *septic tank* and a process called

## SEWALL, SAMUEL

*subsurface irrigation* are used. The principle of the septic system is that in all surface soil there are certain bacteria which make the waste matter harmless.

The sewage first enters the septic tank, which is closed to both air and light. Here its own bacteria break up most of the solid matter in the sewage. The tank is usually brick, concrete, or steel. It should be deep enough in the ground so that the sewage never falls below the temperature of 60° F. About once a year is usually often enough for cleaning.

Part of the sewage in the tank is discharged into distributing pipes about four times a day. The pipes are located beneath the surface of the earth, at different levels. The sewage is discharged into the pipes with a sudden force which causes it to seep into the soil from the pipes. Heavy soils may soon become saturated, so that the bacteria are unable to do their work. Therefore, the distributing system is divided into two parts, which are used alternately.

A.M.Bu.

**SEWALL, SAMUEL** (1652-1730), was the presiding judge at the Salem (Mass.) witchcraft trials of 1692. He condemned nineteen persons to death as witches. Five years later he repented his action.

**SEWARD, SOO** *urd*, **WILLIAM HENRY** (1801-1872), was United States Secretary of State during the War between the States.

Seward was born in Florida, N.Y., and was educated at Union College, New York City. He became a lawyer in 1822, and soon entered politics as a Whig. He served in the state legislature, was governor of New York from 1838 to 1842, and in 1849 entered the United States Senate. Seward firmly fought the spread of slavery.

In 1860, after Abraham Lincoln defeated him for the Republican presidential nomination, Seward worked hard for Lincoln's election, and later was appointed Secretary of State. In this high office, he reorganized the diplomatic service and succeeded in preserving the confidence of Europe, which had been ready to give support to the Confederacy. Lincoln's assassins also intended to kill Seward. One of John Wilkes Booth's accomplices broke into Seward's home and wounded him. But he slowly recovered, and kept the office of Secretary of State under Andrew Johnson. Among the important tasks that he accomplished were the adjustment of the Alabama Claims, and the negotiation of the treaty by which the United States bought Alaska from Russia. Alaska has since proved its worth, but at the time of the purchase the great territory was mockingly called "Seward's Folly" and "Seward's Ice Box."

W.B.H.

See also **ALASKA** (American Purchase); **TRENT AFFAIR**.  
**SEWARD PENINSULA.** See **ALASKA** (Location).

**SEWELL, ANNA** (1820-1878), wrote *Black Beauty*, one of the most popular children's books of all time. This story of a horse, told in the first person, expresses the author's deep feeling for humane and sympathetic treatment of animals. Anna Sewell was born at Yarmouth, England. Her love for her own horse influenced her to write *Black Beauty*.

**SEWELL, SOO** *el*, **HELEN** (1896- ), is an American illustrator of children's books. She was born at Mare Island Navy Yard, Calif., and studied at Pratt Institute. She illustrated *Bluebonnet for Lucinda*, *Head for Happy*, and *Little House in the Big Woods*.

H.B.O.



St. Luke's Hospital

**SEWING.** Like weaving, the craft of sewing dates back to the dim past, before writing was invented. We do not know which was known first — weaving or sewing. We do know that before the early Egyptians made sewed garments, they wove cloth and tied pieces together to make clothes. But we also know that primitive tribes sewed skins together with tendons before they learned to weave cloth.

Before the age of industry, most of the family clothing and household linens were made in the home. Often the housewife took the flax from the plant or the wool from the sheep, spun it into yarn, and then wove the yarn into cloth. In those days the spinning wheel and loom were seen in every home.

The Industrial Revolution came at the beginning of the 1800's. In the United States, mills and factories sprang up all over the Eastern states. Soon the rag carpets and the beautiful coverlets and the homespuns were laid away in the attic, or given away. Their place was taken by the new commercial products. Not only that, but women and girls found employment in the factories. Soon weaving became almost a lost art.

But even though our cloth is manufactured for us, every girl should know how to patch and darn and sew a hem. Many girls also get a great deal of pleasure through making some of their own garments. Such clothes are often genuinely flattering, and homemade clothing is often cheaper and more durable than factory-made garments. Since 1854, schools have encouraged the art of sewing among girls. In that year the women of Boston succeeded in having sewing taught in the city schools. Today sewing is taught in every up-to-date high

school and in a number of normal schools and colleges.

As with any other craft, a girl must develop skill before she can enjoy making a garment or enjoy wearing it after it is finished. The actual sewing of the garment should be so easy that attention can be given to the design and flattering lines, rather than to the handling of the materials. For this reason every beginning seamstress should first make very simple garments or household articles. Firm, soft materials such as gingham or print, are fine for the beginner. She should select and learn to use the necessary tools and should master the basic stitches and construction processes.

### Sewing Tools

**Needles** come in various sizes and kinds. Plain sewing is best done with *sharps*, which are needles of average length. Size 8 sharps are suitable with numbers 50 to 70 thread. Size 9 sharps are suitable with 80 to 100 thread.

**Cotton Thread** is of two general types. *Six-cord* thread comes in white and black. *Mercerized* thread comes in a wide range of colors. Six-cord thread is stronger than mercerized, because it has more strands and is twisted tighter. White and black come in many sizes.

**The Thimble** is a metal or plastic cap which fits over the end of the third finger of the sewing hand. It protects the finger and saves an extra motion in pushing the needle through the cloth.

**Scissors** come in various lengths and kinds. They should be of good steel with sharp cutting edges all the way to the points. Six-inch scissors or shears are suitable for cutting out garments. Shorter scissors are suitable for cutting threads, as well as for gashing and trimming edges.

**Pins** should be of copper or steel, with sharp points. Dressmaker pins in size 5 are good.

**Tape Measures** should be of stitched double cloth with metal tips. They should be reversible, numbering 1 to 60 inches on one side, and 60 to 1 on the other.

**An Iron** is used by every good seamstress to press her work as she goes along. Pressing prevents inaccurate, crooked stitching and can frequently take the place of basting. For best results, ironing should be done on a well-padded ironing board.

**The Sewing Machine** is the most used tool of all. In learning to use a machine, the beginner should first practice on ruled paper without a thread. She should learn to stitch on the lines by watching the position of the front of the presser foot, rather than the needle. When using thread, she should pull both top and bottom thread to the back so they will not knot up when starting. Stitches should measure twelve to fifteen to the inch for ordinary sewing. The good seamstress always tests the tension of her threads by a practice stitching on two thicknesses of cloth. Then she adjusts the tension of the top thread so that it matches that of the bottom thread.

### Basic Stitches

**The Basting Stitch** is a temporary stitch which is used to hold two pieces of material together and to guide the permanent sewing. In *even basting*, the stitches and spaces are of the same length. In *uneven basting*, the stitches and spaces are uneven. The pieces of cloth

should be pinned together before they are basted. When skill is developed, pinning and pressing may take the place of basting.

**The Running Stitch** is a small regular stitch made by passing the needle over and under an equal amount of material. The cloth should be held straight and taut with the thumb and forefinger of the left hand, about an inch away from the point of the needle. The needle should be pushed with the thimble and woven through the cloth. When the needle is full, the cloth should be pulled off the needle.

When the running stitch is used for gathering, only one end of the thread should be fastened. A long tail of thread should be left at the other end until the material is pulled up. It is best to make two rows of gathering about a quarter of an inch apart. It will then be much easier to arrange the fullness evenly.

**The Plain Hemming Stitch** is a slanting stitch used to hold a folded edge down to the material. It is made by placing the needle through the material and the folded edge of the hem. The needle should be slanted slightly, and the stitches kept small and at uniform distances. Starting without a knot, tuck the end of the thread under the fold of the hem. Hold the hem over the forefinger of the left hand. Finish with three little stitches in the fold. Then stitch the needle back through the fold so that the end of the thread is concealed. This makes a firm but elastic stitch.

**Slip-Stitch Hemming** is used on the bottom of skirts, where stitches should not be seen and the hem should be smooth. Take a very small stitch in the garment parallel with the hem. Slip the needle through the fold of the hem about one-quarter of an inch from this stitch. Then repeat the operation.

**The Overhand Stitch** is a straight stitch used to join folded or selvage edges, hem napkins, or sew lace on a finished edge. Lace should be held next to the seamstress, to give it a slight fullness. Start without a knot, working over the end of the thread. Insert the needle at right angles to the edge of the material. Do not take too deep a stitch; otherwise a ridge will be formed. Fasten by sewing back over the stitches.

**The Overcasting Stitch** is a loose stitch made over raw edges to prevent raveling.

### Simple Construction Processes

Usually plain sewing means the making of simple household articles, underwear, and children's garments. Dressmaking means the making of garments which require designing and fitting. The simple construction processes given below are needed for both.

**Seams** are used to join two parts of a garment together. Only the simplest kinds are described here.

The *plain seam* is made by placing the right sides of the cloth together, pinning, basting, and then stitching on the seam line. There are several ways to prevent the material in the seams from raveling. Firm material may be trimmed evenly or pinked with pinking shears, and pressed open. Edges which ravel may be pressed open and "self-stitched." Each edge is either turned down by hand or stitched by machine. Another method is to overcast the two edges together. Still another method is to press both edges of the seam to one side and stitch by

machine on the right side. This is somewhat like the *flat-felled* and *lapped* seams.

The *lapped seam* is a tailored seam. The seam allowance of the top piece of material is pressed to the wrong side. This pressed edge is basted to the seam line of the adjoining piece. It is then machine-stitched. This seam is also used when a ruffle or piping is put into the seam. The folded edge is basted to the ruffle or piping and basted a second time to the adjoining piece. Then it is stitched.

*Flat-felled seams* and *French seams* require more skill to make. They have no raw edges showing.

**Bias** is a line which cuts diagonally across the cloth. Ordinary cuts are made along the line of the thread. Bias-cut material has an advantage over ordinary cut material in that it can stretch and can be held in without fullness. To obtain a true bias, fold the cloth so that the lengthwise threads of the cloth lie parallel with the crosswise threads. Press the fold. Open it out and mark off the number and width of bias strips needed. Cut the

ends of the strips along the lengthwise threads of the material and piece together as shown in the illustration.

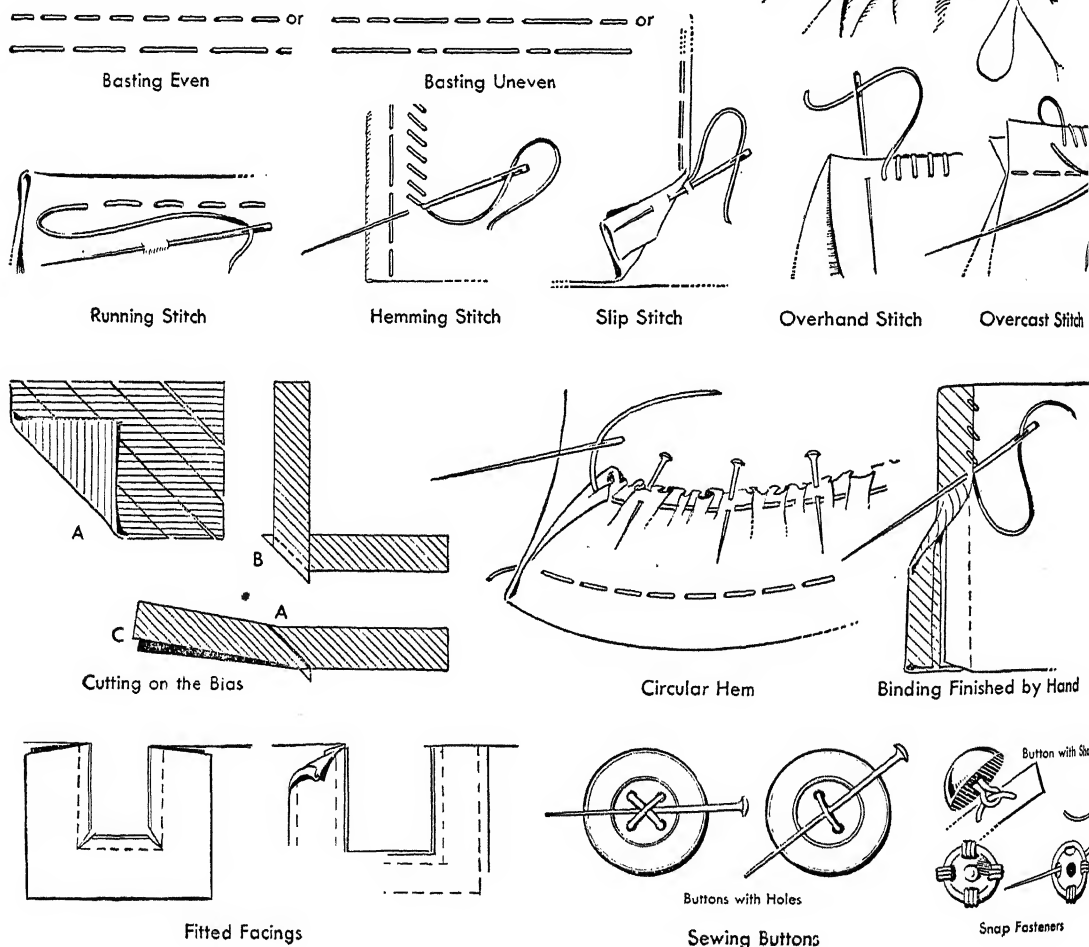
**Edge Finishes** are used to give a finished appearance to an edge. The most common types are hems, facings, bindings, and bands.

The *hem* is made by turning the raw edge of the article down about a quarter inch on the wrong side, then turning it down again the width desired. Curved hems like those on the bottom of flared skirts should not be too wide. The first quarter-inch fold should be gathered slightly to distribute the extra fullness evenly.

A *facing* is a separate piece of material sewed to lie flat on either the right or wrong side of the garment. Narrow facings are usually cut bias and placed on the wrong side. Fitted facings are cut to fit the garment in shape and match the weave or grain of the cloth.

With right-sided facings, the right side of the facing is first placed against the wrong side of the garment. With wrong-sided facings, the right side of the facing is placed against the right side of the garment. Pin, baste,

## TYPES OF STITCHES IN SEWING



and stitch a quarter-inch seam. After the seam is pressed open, turn the facing and baste on the edge. The raw edge of the facing should be folded under and basted flat to the garment. Right-sided facings are edge stitched. Wrong-sided facings are slip stitched or fastened at the seams.

A *binding* is a narrow-edged finish which always shows. The edge to be bound should be cut without a seam allowance. Strips of bias material one inch wide or less are then stitched on the right side of the garment, three-eighths inch or less from the edge. The binding is pressed flat against the seam and then folded around the seam. The wrong side can then be finished by hand or by machine.

*Bands* are used at the waistline or bottom of the sleeve as belts and cuffs to hold in fullness. They are really wide bindings, cut on the lengthwise threads of the material rather than on the bias. Before stitching, the seamstress must carefully fit the gatherings to the band and arrange the gathers evenly.

*Plackets* are finished openings in a garment to make it possible to slip the garment over the wider parts of the body. Plackets at the front or back of necklines are usually faced. Plackets in gathered skirts are usually hemmed. Those in fitted skirts or underarm seams are tailored and finished with a zipper or snaps. Most garment patterns contain directions for the plackets needed.

### Fastenings

**Buttons** may be used as either decorations or fastenings. Their position on the cloth should first be marked very carefully, so that they will be evenly spaced. Starting with a knot and double thread, take a small stitch on the right side of the material so the knot will be under the button. Place a pin across the top of buttons with holes or under buttons with shanks and sew over the pin three to five times. Remove the pin. Bring the thread up under the button and wrap it around the threads so there is a strong thread shank. Then fasten the thread on the wrong side of the material.

**Snaps** should also be carefully placed. First sew the ball half of the snap on the front side of the placket. Then rub the ball with chalk and press it into the back side. This will mark the position for the socket half of the snap.

**Other Fastenings** include hooks and eyes, and "zippers," or slide fasteners. They must be sewed onto the clothing. Many dresses, particularly house dresses, are fastened only by belts or ties. Designs for these ties are usually included in the patterns of the dresses. J.F.E.

**Related Subjects.** The reader is also referred to:

### SEWING AND NEEDLEWORK

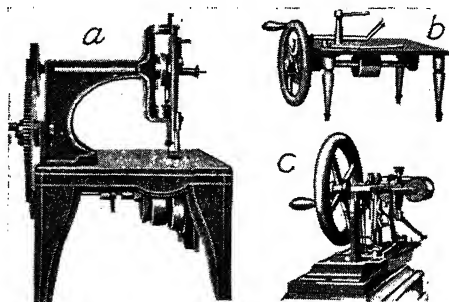
Appliqué	Hobby (Books about
Button	Hobbies [Needlecraft])
Clothing	Knitting
Colonial Life in America	Needlepoint
(Needlework)	Petit Point
Crochet	Quilt
Dressmaking	Sampler
Embroidery	Singer, Isaac Merrit
Garment Industry	

### SEWING TOOLS

Needle	Scissors	Sewing Machine	Thread
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**SEWING MACHINE.** A sewing machine uses a needle to bind materials together with thread. It has lightened the household work of women in every civilized country. In industry it has been an important factor in the great expansion of clothing manufacture.

Thomas Saint, an Englishman, patented the first sewing machine in 1790. It was wooden and made a single-thread chain stitch to stitch leather. The thread was fed automatically to a needle which had a notch instead of an eye. An awl made holes for the needle to pass through the leather. This machine was not practical. In 1830 a machine for making soldier's uniforms was patented in France by Barthélemy Thimonnier. His machine used a hooked needle that made a stitch by passing backward and forward through the cloth. The government had as many as eighty of these machines in use at one time. Thimonnier was almost killed when a mob of angry workmen wrecked the uni-



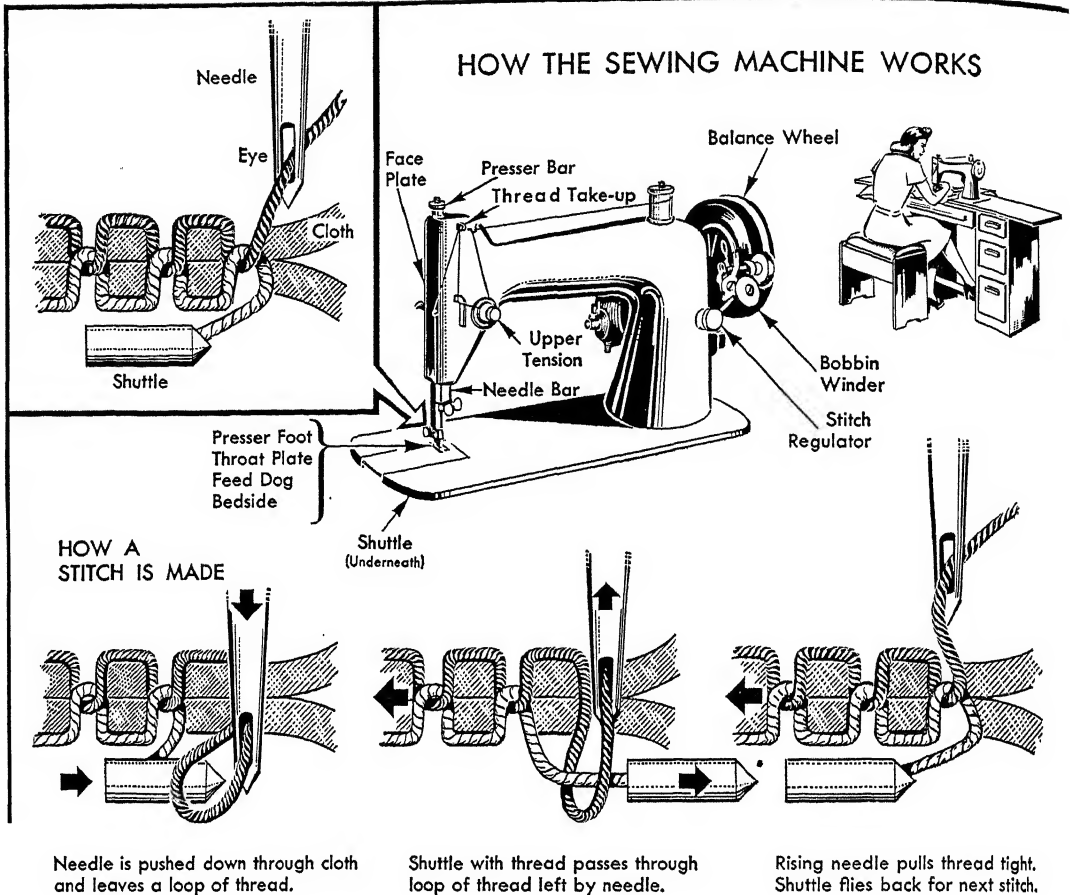
**Early Sewing Machines.** (a) The Singer; (b) Wilson's earliest model; (c) Elias Howe's original sewing machine

form factory because it put many of them out of work. He was unable to revive interest in his machine.

Elias Howe is usually considered the inventor of the sewing machine as we know it today. His model, patented in 1846, was the first practical machine sold to users. Howe's machine had a needle with an eye near the point. A shuttle carried a thread below the cloth on a small bobbin. The needle, carrying an upper thread, was fastened to an arm that vibrated on a pivot. Movement of the arm forced the needle through the cloth. The shuttle carried the under thread through the loop of the upper thread, thus making a lock stitch. Nearly all sewing machines used in the home today are of this double-thread, lock-stitch type. A few women prefer the single-thread, chain-stitch machine, such as the Wilcox and Gibbs. The lock stitch is much like weaving in formation. It is less likely to ravel than the chain stitch, which is somewhat like the stitch used in crocheting. Of the inventors who came after Howe, A. B. Wilson and Isaac Singer deserve special mention. Wilson introduced the four-motion automatic feed used on nearly all modern machines. It was patented in 1854. In 1851 Singer had patented the foot-operated treadle and the presser foot with a yielding spring, which holds the fabric down on the feed plate.

Sewing machines are made today for every known kind of sewing. Those used in the home have many attachments for doing various kinds of work. Fine hand





sewing and hand embroidery can be imitated by machines which will stitch in any direction. There are machines to do hemstitching, tucking, and hemming, sometimes with twelve needles in a row on one machine. Other machines make buttonholes, and some sew on buttons. There are special machines for sewing boots and shoes, books, umbrellas, and brooms. There is even a machine for sewing carpets together. This one travels along the carpet it stitches because the carpet is too heavy to be moved easily. The electric sewing machine was invented more than fifty years ago by the Singer Manufacturing Company and is widely used today. See also HOWE, ELIAS; SINGER, ISAAC M. J.F.E.

**SEX** is the method by which the higher animals and plants reproduce their kind. Most insects and all fishes, reptiles, birds, and mammals reproduce by sexual means. So do mosses and ferns at some stage of their life cycle. All flowering plants reproduce by sexual means. The flower, in fact, is the sexual organ of the plant.

Usually one organism in sexual reproduction is male and one is female. But in some animals such as the earthworm, the same animal may have both female and male organs. The same plant may also contain male and female flowers. Plants which contain both male

and female flowers are called monoecious. Plants which have the male and female growing on separate plants are called dioecious. See HERMAPHRODITE.

The two cells that unite to produce the new organism are called gametes. If the gametes are alike, as in some plants and animals, they unite in a process called conjugation. When they are unlike, the female gamete is usually stationary and the male gametes move to the egg in the process of fertilization. The male gamete is called the sperm and the female gamete is called the egg.

There are two great advantages to sexual reproduction. One is that union of two different gametes tends to keep the protoplasm healthy and active. In animals and plants which do not reproduce by sexual means the protoplasm tends to lose its vitality. The great advantage of sexual reproduction is that by means of it the hereditary characters carried by the cells from two different organisms are recombined to increase the range of variation. This variation helps a race of living things to adapt itself to its environment.

Among human beings the development of sexual characteristics depends upon the proper functioning of various glands of internal secretion.

For human beings sex is more than a merely physical problem. It is involved with moral teachings and with

intense psychological problems from the time of adolescence on. Some students of psychology, such as Sigmund Freud, have felt that the sexual instincts are among the most important of all human drives. Not all authorities agree with Freud, but all agree that sex is a very important human problem. The adjustment to the sexual role is one of the most important any individual can make.

G. W. BE.

See also **SEX EDUCATION**; **SEX RATIO**.

**SEX EDUCATION.** For a great many years there has been a strong movement in favor of teaching children and adolescents the basic facts regarding sex and reproduction in human life. Many persons feel that sex education should also include education for the attitudes and understandings which will help individuals meet their sex problems successfully at all stages of development, and which will lead to wise selection of a marriage partner and to happy and stable marriage. Present rates of divorce, illegitimacy, venereal disease, sex delinquency, and many mental and emotional disorders indicate the great need for education in this field.

Each boy and girl in growing up gains some sex information and develops his own attitudes toward sex, without any organized attempt at sex education by family, school, or church. Much misinformation is picked up in this way from companions and from other sources. Even correct information may be acquired in a way which will develop undesirable attitudes and lead to mistakes and unhappiness. The fact that young people are sure to get a certain amount of sex information is regarded as a very strong argument for a planned educational program. It is not safe to trust so important a subject to the chance impressions gained from sensational newspaper stories, from magazines, motion pictures, and the other sources which are available to most children.

One of the traditional reasons for adult hesitation to supply sex information to youth has been the fear that such information will arouse undesirable curiosity and experimentation. Newer knowledge of child development and psychology indicates that sex is an important factor in personality development from the time of birth. Curiosity about sex is normal and desirable. If it is accepted as normal, and questions are answered as they arise, unwholesome curiosity is less likely to develop than with a policy of evading questions.

Inevitably the home is important in developing good or bad attitudes toward sex and sex information. Where parents are willing and able to give simple, factual answers to the questions of their children, sex seldom takes on any unusual importance or mystery. But a great many parents can not handle sex education in this way, either because they do not themselves have accurate and adequate information, or because they do not know how to talk about what they know, or for some other reason. To meet the needs of children from these families, organizations such as the American Social Hygiene Association have urged that the schools, which have contact with all children, should undertake a program of sex education. Schools have done this with very satisfactory results in many places, but such programs are still far from general.

The experts agree that a school program should stress

the normality of sex and the right of young people to understand this basic factor in their lives. Boys and girls should learn all the scientific facts of sex needed to protect their physical and mental health. The program should help them see mankind as part of the whole world of living things, but it should also help them understand that the sexual conduct of human beings ought to be and can be determined on the basis of the intelligent choice of the individual. It should help them understand themselves and their friends of both sexes, and aid them in meeting the problems of growing into adulthood with its responsibilities of marriage and parenthood.

A good sex-education program requires adult recognition that sex is important from birth, and that individuals learn to assume their sex roles through a long process of development. When young children first ask where babies come from they should be given simple, but honest and factual answers. Preadolescent boys and girls should be helped to understand the changes taking place in their bodies as they approach maturity, and they should also understand the corresponding changes in the opposite sex. Adolescents need to understand the emotional side of sex, and to recognize that it is normal for them to develop an interest in the opposite sex. They need to know what kinds of behavior are permissible between boys and girls, and the reasons behind some of the accepted standards and conventions of our society.

At all ages young people need to be able to get honest answers to the questions which are puzzling them. This is important from the point of view of mental health as well as of personal hygiene. Some children can get answers from their parents. Others need to find some adult to consult, a teacher, nurse, doctor, minister, Boy Scout leader, or some other mature person who will give understanding attention to their questions.

At some age most children learn from their companions various vulgar words in talking about sex. Sex education has the responsibility for supplying students with a scientific vocabulary which permits dignified discussion of natural processes. Classes in general science and biology offer a good opportunity for teachers to develop this vocabulary, as well as to give much information in a natural setting. Many other classes can also make important contributions. A few schools have a special course in social hygiene. This may be a desirable arrangement under some circumstances, but it is usually better to have aspects of sex information treated in their natural relationship to other biological, hygienic, and social information.

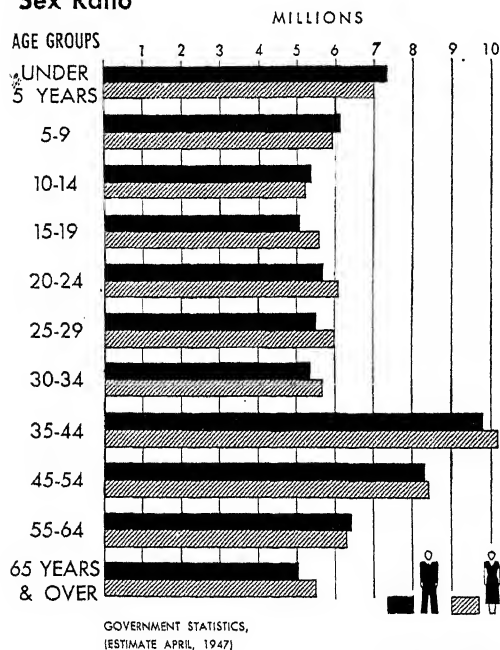
Many books have appeared in recent years as part of the general movement for better sex education. Most of these books are written in a simple, direct, and dignified manner. Some are planned to help parents answer the questions of their children. Others are meant for teachers who are developing a school program. Still others are intended for direct use by children and adolescents, either to substitute for, or to supplement, home and school instruction. Books of this kind are becoming generally available in school and public libraries and deserve wide use. They can do much to promote sane programs of education to replace the policy of secrecy and mystery.

The American Social Hygiene Association, New York City, issues free bulletins which give classified lists of sex-education books and pamphlets for students, parents, and teachers. The United States Public Health Service, Washington, D.C., and many state boards of health distribute excellent sex-education pamphlets, prepared for general readers.

M. WIL.

**SEX RATIO** is the proportion between the number of boys and girls that are born. Science has not yet been able to explain why there are 103 to 107 boys born to every 100 girls born. Thousands of birth records have been studied, both of man and animals. These studies reveal that many of the higher animals have slightly more of one sex than the other. Among horses, about 98 male colts are born to every 100 females. Sheep have the same sex ratio. Chickens have more hens than roosters, with about 95 male chicks to every 100 female chicks. Pigeons have about 115 males to 100 females.

### Sex Ratio



One theory has been advanced that humans have more males because nature is making up for the men killed in war. This theory has no scientific basis. G.W.BE.

**SEXTANT.** The sextant is an instrument for measuring the angular distance between any two points, such as the sun and the horizon. Sailors use it to determine the position of a ship at sea.

The frame of a sextant supports the graduated arc of a sixth part of a circle, a movable arm which represents the radius of the circle, two mirrors, and a small telescope. One mirror is fixed and is known as the *horizon glass*. The second mirror is screwed to the movable arm, or index bar, and is called the *index glass*. The telescope sharpens the line of the horizon.

The sextant is held so that the arc is vertical and the



Press Syndicate

**Navigator "Shooting Stars" with a Sextant** to find the ship's position at sea. He catches the reflection of a star in the sextant mirror. By measuring the angle of a star above the horizon and consulting a chronometer, he can determine his position.

horizon shows in the horizon glass. The operator looks through the telescope at the horizon glass. Then he moves the index arm until the image of the sun or a certain star, reflected in the index glass, touches the horizon line. The altitude of sun or star may be read from the graduated arc. The sailor then compares this altitude at various degrees of latitude. Thus he finds the latitude of his ship.

The sextant uses the optical rule: If an object is seen by repeated reflection from two mirrors perpendicular to the same plane, the angular distance of the object from its image is double the inclination, or tilt, of the mirrors. The sextant's index measures the angle between the mirrors. This is half the angular distance between the mirrors. Thus, half degrees must be read as full degrees.

J.J.F.

**SEXTON BEETLE.** See BURYING BEETLE.

**SEYHAN.** See TURKEY (Cities).

**SEYMOUR, CHARLES** (1885- ), is an American historian and educator. In 1937 he became president of Yale University, where he had been a member of the faculty of history since 1911. He was born in New Haven, Conn., and was educated at Cambridge University in England, the University of Paris, and at Yale. Seymour served on various international commissions, including the Paris Peace Conference of 1919. E.W.KN.

**His Works** include *The Diplomatic Background of the War; American Diplomacy During the World War; and The Intimate Papers of Colonel House*.

**SEYMOUR, JANE** (1509?-1537). See HENRY (VIII, England).

**SEYSS-INQUART, ZYS-ING kvahrt, ARTUR VON** (1892-1946), was a leader in the Nazi government of Germany. He was an Austrian politician who helped betray his country to the Nazis. As a reward he was appointed governor of the Austrian territory. Seyss-Inquart was born in Stannern, Bohemia, into a Sudeten German family. He was educated at the University of Vienna,

and became a successful lawyer. During the 1930's Seyss-Inquart secretly became a member of the German Nazi party and helped plan the Nazi seizure of Austria. He became Prime Minister Kurt Schuschnigg's trusted advisor. After the success of his work in Austria, Seyss-Inquart was appointed High Commissioner for The Netherlands. At the end of World War II he was arrested by the Allies and tried at Nürnberg as a war criminal. He was found guilty and was hanged. F.S.M.

See also NÜRNBERG TRIALS.

**SFORZA, SFAW tsah, CARLO, COUNT** (1873- ), is an Italian statesman. From 1923 until Benito Mussolini fell in 1943, he was the leader of the Italian anti-Fascists. Sforza was born in Lucca and was educated at the University of Pisa. In 1911 he became Minister to China and continued in the diplomatic service until after World War I.

In 1920 Sforza was named Minister of Foreign Affairs. During his term of office he negotiated the Treaty of Rapallo with Yugoslavia. When Mussolini became dictator in 1922, Sforza resigned his position. In 1928 he was forced to flee to Belgium, and later to France, where he carried on his opposition to Fascism. During the early part of World War II, he lectured at American universities. In 1943, Sforza returned to Italy, and served as high commissioner for the punishment of Fascist crimes. He became Foreign Minister in 1947. F.S.M.

**SFORZANDO, s'fawr TSAHN doh.** See MUSIC (Terms).

**'s GRAVENHAGE, s'KRAH ven HAH keh.** See HAGUE, THE.

**SHACKAMAXON, TREATY OF.** See PENNSYLVANIA (History).

**SHACKLETON, ERNEST HENRY, SIR** (1874-1922), was an Irish Antarctic explorer. Shackleton led a British expedition which in 1909 came within ninety-seven miles of the South Pole. The expedition landed at Erebus Island, South Victoria Land. Shackleton climbed Mount Erebus, and then started by sledge toward the pole. He reached a height of 11,600 feet above sea level, and made observations at the South Magnetic Pole. But violent storms and a food shortage forced the party to turn back. Shackleton wrote *Heart of the Antarctic* about this trip.

Shackleton was born at Kilkee, Ireland, and attended Dulwich College. In 1901 he went with Robert F. Scott's National Antarctic expedition. In December, 1914, he started on a thrilling expedition into the ice pack in the Weddell Sea. The ice crushed his ship and he made an 800-mile trip over the ice to get help. In 1922 he began his third Antarctic trip but died shortly after he started. J. Cor.

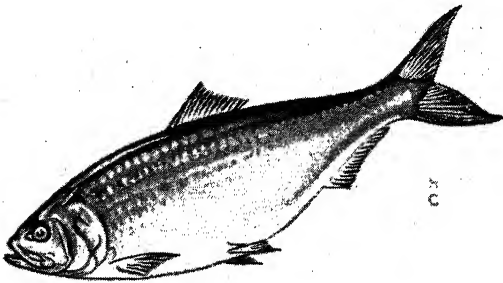
See also POLAR EXPLORATION.

**SHAD** is an important food fish of the herring family. The American shad lives in sea water from Newfoundland to Florida. It was introduced into the Pacific coastal waters by the former United States Bureau of Fisheries. The shad goes up fresh-water rivers to spawn. At that time, large numbers of shad are caught in nets. Shad average about three pounds in weight, and are about two feet long. They are bluish above, with silvery sides. Shad fisheries, which are operated only at spawning time, have been greatly overworked, especially those of the east-coast rivers. So-called "Potomac shad" is shipped from the Pacific Coast to eastern markets on ice.



Shackleton's Men Fighting an Antarctic Blizzard While Attempting to Reach the South Pole

Most shad are eaten fresh, but a few are smoked or salted. Their eggs are sometimes used in making caviar.



**The Shad Is a Delicious-tasting Fish**, which lives off both the Atlantic and Pacific coasts of the United States. It has a short spineless upper fin and a forked tail. The upper jaw has a notch into which the tip of the lower jaw fits.

They are the best substitute for the roe of the sturgeon, from which caviar is usually made. L.P.Sc.

See also HERRING.

**Classification.** The common shad is known as *Alosa sapidissima*.

**SHADDOCK.** See GRAPEFRUIT.

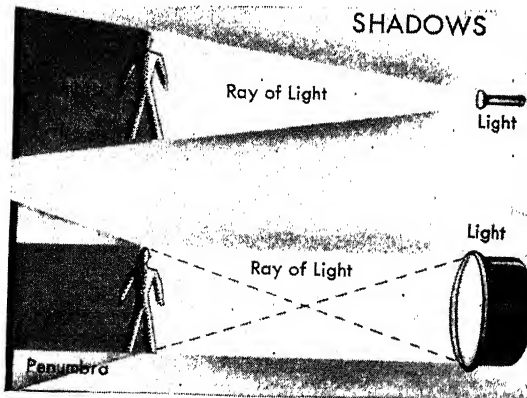
**SHADE.** See COLOR (color plate, Tint and Shade).

**SHAD FLY.** See MAY FLY.

**SHADOOF, *shah DOOF.*** See EGYPT (Agriculture).

**SHADOW, *SHAD oh,*** is a darkened space behind an object which is in light. This object must be opaque, or one through which light can not pass. The east side of an opaque object will be dark if light is shining from the west. There are shadows all around us. We see shadows of clouds on meadows and on water, shadows of trees and buildings, and shadows of ourselves. The light of the sun causes the earth to throw a huge shadow into space. The moon may be partly or completely eclipsed, or shadowed so we can not see it, if it passes into this darkened space.

The accompanying diagram shows how shadows are formed. At the top the source of light is a tiny point, like a flashlight. The light rays are stopped by the opaque figure. No light at all passes the figure, and the space be-



tween the figure and the screen is completely darkened. A complete shadow such as this is called an *umbra*. Below, the source of light is larger. In this case the shadow directly behind the figure is darker than the rest of the shadow. This is the *umbra*. The space where only part of the light is cut off is called the *penumbra*. E.A.Fr.

See also ECLIPSE; PENUMBRA.

**SHADOW MOUNTAIN DAM** forms Shadow Mountain Lake which connects with Grand Lake in north-central Colorado. It is part of the Colorado-Big Thompson Project, which is designed to furnish a supplementary water supply to 615,000 acres of farm land and electric power to cities and towns in Colorado, Nebraska, and Wyoming. Shadow Mountain Dam is an earth dam and has a capacity of 15,000 cubic feet of water. The dam was built by the United States Bureau of Reclamation. See also DAM.

**SHADOW PLAY, or SHADOW PANTOMIME**, is a kind of drama in which the figures of puppets or living actors are thrown in silhouette on a screen. The players or puppets are behind the screen and their shadows are thrown on the screen with a strong light. The play is usually acted out in pantomime without dialogue. See also list of books at the end of the THEATER article.

**SHADWELL, THOMAS.** See POET LAUREATE.

**SHAFTER, WILLIAM RUFUS** (1835-1906), was an American soldier who served as commander of land operations in Cuba during the Spanish-American War. In a month's fighting his forces captured Santiago and the entire eastern section of the island. Shafter was born at Galesburg, Mich., and joined the regular army in 1866. After the Spanish-American War, General Shafter commanded in turn the departments of the East and of California and Columbia. He was retired from the army in 1901 with the rank of major general. F.T.M.

**SHAFTESBURY** was the name of a distinguished English family. Three of the Shaftesburys were especially famous in the history of England.

**Anthony Ashley Cooper, Earl of Shaftesbury** (1621-1683), was an English statesman. He forced the passage of the Habeas Corpus Act in 1679. This act has become one of the mainstays of freedom under English law. See HABEAS CORPUS.

Cooper was born at Wimborne, in Dorsetshire. He was educated at Oxford University, and entered Parliament in 1640. At first he supported the king against the Puritans. But he soon switched and joined forces with the Puritans. He became one of the founders of the Whig party. It was said in England that the Devil had been the first Whig, but that Shaftesbury was the second. He became a general under Oliver Cromwell and was a powerful figure in the Commonwealth. See WHIG.

After the death of Cromwell, Shaftesbury began to plan for the return of King Charles II. His efforts won him a pardon for his previous actions when the king returned. The new king made him Baron Ashley, and Shaftesbury continued as a powerful figure in England.



Historical Pictures

**The Earl of Shaftesbury** made habeas corpus a principle of English law.





Historical Society of Pennsylvania

**Colonial Shakers at Worship** claimed to receive a spiritual power which caused them to tremble. A church leader said he saw the Hosts of Heaven worshipping in this manner, and he

Shortly afterward, he was made Earl of Shaftesbury and Lord Chancellor. Shaftesbury was a member of the Cabal and supported the Test Acts against the Catholics. (See CABAL.) His support of the Test Acts cost him his office. He was thrown into the Tower of London in 1677, and remained there for a year.

In 1679 he became president of the Privy Council and secured the passage of the Habeas Corpus Act. But he became involved in a plot against the king. He was arrested for treason, but escaped and fled to Holland, where he died.

Shaftesbury was used as a character in two well-known writings. He appears in Samuel Butler's *Hudibras* and in John Dryden's "Absalom and Achitophel."

**Anthony Ashley Cooper, Earl of Shaftesbury** (1671-1713), was an English writer and philosopher. He was a grandson of the first earl, who was his guardian as a boy. He was educated under the great philosopher John Locke, and was himself a writer and philosopher of note. Shaftesbury was the first to use the phrase "moral sense" for man's ability to distinguish between right and wrong.

His works include *Characteristics of Men, Manners, Opinions, Times, and Letters*.

**Anthony Ashley Cooper, Earl of Shaftesbury** (1801-1885), was an English statesman and philanthropist. He was educated at Harrow School and at Christ Church College, Oxford University. He served in Parliament from 1826 to 1851.

Shaftesbury became known for his interest in social conditions. He led a movement to improve the treatment of the insane, and worked to better the conditions of the poor people of England. He was also chairman of the Crimean sanitary commission during the Crimean War.

A.M.

**SHAGBARK.** See HICKORY.

**SHAGREEN,** *shah GREEN.* See SHARK.

taught the movements to his people. When Shakers worship, they chant wordless songs which they practice regularly. Modern Shakers still tremble and chant at their meetings.

**SHAH JAHAN,** *shah jah HAHN* (1592-1666), was the fifth ruler of the Mogul Empire in India. He is remembered most for the beautiful white marble Taj Mahal, which he built as a tomb for his wife, Mumtaz Mahal. Shah Jahan brought Moslem architecture to its greatest development in India. Some of the buildings whose construction he directed are considered to be among the most beautiful in the world. Most of them are still standing.

He was the son of Jahangir, and became ruler in 1627. His reign was a troubled one, and one of his sons took his throne by force eight years before his death. Shah Jahan founded one of the modern cities of Delhi, and built the Pearl Mosque at Agra.

H.F.MAGN.

See also DELHI; TAJ MAHAL.

**SHAKER** is the name given to members of the religious sect called the United Society of Believers. The sect was started in England about 1706. In 1758, Ann Lee joined the society, and in 1770 she was recognized by members as the first leader of the Church of God on earth. Shakers called her *Mother Ann* and made her the head of the society.

A group of Shakers came to America in 1774 and organized a society at Watervliet, N.Y. This was the first communistic organization in the United States. All property belongs to the community as a whole. Members of the United Society of Believers are called *Shakers* because during religious exercises their intense emotions cause them to quiver and shake. Shakers do not marry, and they bear no children. The sect is kept alive only through converts. There are now fewer than 100 members.

G.R.M.



#### SHAKESPEARE'S BIRTHPLACE

*Above:* Both of these buildings, on Henley Street, in Stratford-on-Avon, were owned by John Shakespeare, the playwright's father. In the family home (left), the world's greatest poet was born. The house on the right served as the father's office. These restored buildings still stand and are shrines visited by thousands of the poet-playwright's admirers. Only a few yards from the house are the lovely fields of Warwickshire, the "heart of England," a region often pictured in Shakespeare's plays.

Photos: Folger Shakespeare Library



#### STRATFORD GRAMMAR SCHOOL

*Above:* The Stratford Grammar School, where Shakespeare received his only formal education, is still in use. Here, it is believed, he learned at least a little Latin and Greek. The stone tower is that of the Guild Chapel, in which troupes of traveling actors performed in Shakespeare's youth. *Left:* When the poet was a boy, this room was used as a classroom. Today it is the school's library.

Photos: Folger Shakespeare Library





## SHAKESPEARE

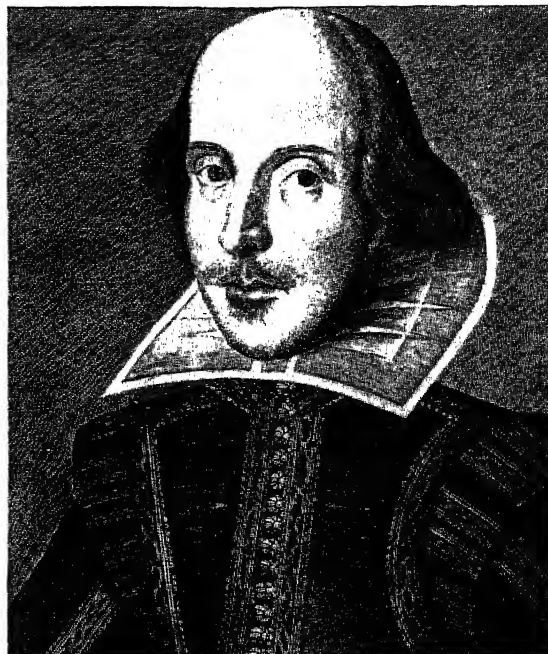
*1? Shaks.*

**SHAKESPEARE, WILLIAM** (1564-1616), is usually considered the greatest dramatist the world has known, as well as the finest poet who has written in the English language. No other writer's plays have been produced so many times in so many countries, and no poet's verse has been so widely read in so many different lands. His works have been translated into more languages than any book in the world except the Bible. Thousands upon thousands of books and articles have been written about Shakespeare and his works. One famous library has more than fifteen thousand volumes of editions of his plays and poems alone. These do not include the thousands of books published *about* the man and his work.

Such unequalled popularity is convincing proof of Shakespeare's influence on millions of theater-goers and readers. Other men of letters have also testified to his greatness. Johann Goethe, the great German writer, said, "I do not remember that any book or any person or event in my life ever made so great an impression on me as the plays of Shakespeare." Thomas Carlyle, the English essayist, once said, "I think the best judgment not of this country alone, but of Europe at large, is slowly pointing to the conclusion that Shakespeare is the chief of all poets hitherto; the greatest intellect who, in our recorded world, has left record of himself in the way of literature."

Among the many literary giants who have testified to the joy and wonder they have felt before Shakespeare's immortal creations are John Milton, John Dryden, Alexander Pope, Joseph Addison, Samuel Johnson, John Keats, Lord Byron, Charles Lamb, Samuel Coleridge, Sir Walter Scott, Robert Browning, Ralph Waldo Emerson, James Russell Lowell, and Walt Whitman. Famous men of different ages and nations have paid so many thousands of tributes to Shakespeare that several anthologies have been prepared to give samplings of them.

**Qualities of His Genius.** One of the reasons for Shakespeare's world-wide appeal is the number and variety of characters he created. They include persons of all types, from all walks of life. Shakespeare understood his characters so deeply and presented them so vividly that for many readers they have become more real than some of the living men about them. Pickpockets and kings, country bumpkins and court ladies, drunkards, dandies,



Folger Shakespeare Library

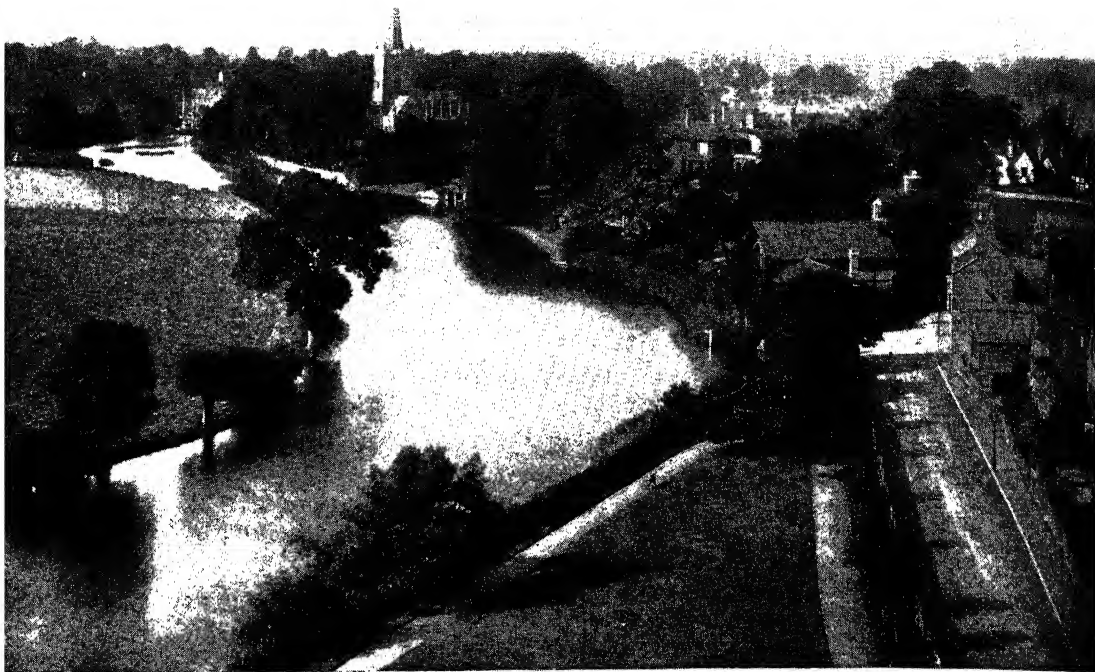
**This Martin Droeshout Engraving of Shakespeare** appeared in the first folio of Shakespeare's plays, published in 1623.

stablemen, generals, lovesick girls, and hired murderers all spring to life in his plays. To many people Hamlet, Falstaff, and King Lear seem far more real than historical characters like Thomas Jefferson and Napoleon. Shakespeare's incomparable creative power is one of the great features of his genius. It cannot be explained, but critics agree that behind it lies a wide acquaintance with men and women of all types in the bustling London of Queen Elizabeth's day.

Another characteristic of Shakespeare is his amazing knowledge of a wide variety of subjects — music, the law, seamanship, the Bible, military science, the stage, art, politics, history, psychology, hunting, woodcraft, animal husbandry, and sports. This knowledge is so wide and accurate that lawyers have tried to prove that Shakespeare must have been a lawyer, and sailors have argued that he must have had experience at sea. Yet as far as his life is known, it shows no professional experience in any field other than the theater. Evidently he had a remarkable ability to pick up miscellaneous information and to use it accurately. He could listen to sailors' talk and then write a sea scene as full of detailed information as is Scene I of *The Tempest*.

### Influence on the English Language

Perhaps the most amazing quality of Shakespeare's genius is his unequalled mastery of the English language. From his pen, the words of kings and the talk of thieves flowed with equal ease. Learned men, such as Prospero, and stupid yokels, like William in *As You Like It*, speak as such persons *would* speak. Many lines spoken by Shakespearean characters are such exact statements of the feeling which many men have experienced, that they are quoted again and again. A large number of expressive words and phrases from the plays have passed into the language and are used today by millions of



**Stratford-on-Avon, Birthplace of the Poet, Is a Small Town about 80 Miles Northwest of London**

persons who have no idea that Shakespeare created them. Such daily, unconscious tributes to Shakespeare's greatness by persons who speak of "the king's English," of "catching a cold," of "disgraceful conduct," of a "foregone conclusion," of "elbowroom," or of "fair play," prove that he has made a deep impression not only on scholars, authors, and theatergoers, but also on every person who speaks the English language.

One of the most lasting impressions which Shakespeare has made on civilization is one which is usually forgotten. It is his influence on the English language as it is used today. When Shakespeare wrote his plays, there were no English grammars or dictionaries, no accepted standards of spelling or grammar or pronunciation. Well-educated men spelled the same word in different ways, and often pronounced it differently. They used grammatical forms which are not allowed today, such as "more braver," "more hotter," "perfecter," "perfectest," "as tall as me," "to who."

The exact meanings of many words were as unsettled as grammar and spelling, and there were no English words for many ideas which are taken for granted today. New words and new expressions were being taken from other languages or invented for the English language. When the language was in such a state of development, it could be influenced for good or bad more easily than it can now. It is very fortunate that at such a time a writer with Shakespeare's sensitive ear and brilliant gift of phrase was writing plays which became popular.

Many of the common present-day words which can be seen any day in the newspaper or heard over the radio were first used by Shakespeare, so far as scholars have been able to find. He was the most successful of the word inventors of his time. From his works come such words as *assassination*, *bare-faced*, *baseless*, *bump*, *countless*, *courtship*, *critic*, *critical*, *denote*, *disgraceful*, *dishearten*, *distrustful*, *dwindle*, *eventful*, *exposure*, *filful*, *fretful*,

*gloomy*, *hurry*, *impartial*, *inauspicious*, *lonely*, *misplaced*, *monumental*, *recall*, *suspicious*.

Even more notable than the words Shakespeare invented are the phrases or expressions he put together. No other English writer has ever approached his gift of coining phrases. "Public haunt of men," "fortune's fool," and "pomp and circumstance," are fair samples of phrases which are now used without quotation marks as standard English, although they are really quotations from Shakespeare. A full list of these widely used phrases from the great dramatist would be very long, but some measure of the debt the English language owes Shakespeare is apparent when the number of familiar phrases which come from a single play are noted. *Hamlet* has the phrases "mind's eye," "primrose path," "to the manner born," "making night hideous," "a tale unfold," "shadow of a dream," "caviar to the general," "flesh is heir to," "mortal coil," "sicklied o'er," "glass of fashion," "out-herod Herod," "hold the mirror up to nature," "counterfeit presentment," "flaming youth," "whet thy blunted purpose," "hoist with his own petard," "fellow of infinite jest," "ribband in the cap of youth." How much poorer the English language would be without the words and phrases which were first brought into it by this actor-playwright more than three hundred years ago!

#### **Shakespeare's Life**

In Shakespeare's time very few biographies were written, and most of those recorded the lives of kings. None of the literary men of the Elizabethan Age was considered important enough for a full biography until many years after his death, and writers of plays were thought to be even less important than poets. Shakespeare himself had been dead nearly a hundred years before anyone tried to write a long account of his life. By that time many of the facts of his life were no longer known, although there were many stories about him,

some false, some possibly true. Certain knowledge of Shakespeare's life is, therefore, very scanty, although no more scanty than for other great literary men of the period. Such facts as there are come mostly from church registers, town records, and accounts of business dealings.

**Early Years.** William Shakespeare was born in Stratford-on-Avon, a fairly important English market town about eighty miles northwest of London, in the year 1564. The registers of Holy Trinity, the parish church in which Shakespeare was buried fifty-two years later, record his baptism on April 26, 1564, and it is generally thought that he was born on April 23, since babies were sometimes baptized on the third day. But there is no proof of the actual date of his birth.

The poet's father, John Shakespeare, was a fairly prosperous glovemaking and trader in wool, hides, and grain. He owned at least five houses in Stratford, and held various offices in the town. He became mayor when his son William was four years old. Shakespeare's mother was Mary Arden, the daughter of a landowner living near Stratford. John and Mary Shakespeare had eight children. William was the third.

Nothing is known definitely of Shakespeare's boyhood in the town of Stratford, but it is highly probable, considering his father's position, that he went to the Stratford grammar school, which was free to the children of citizens of the town. In grammar schools of the time the boys studied Latin chiefly, so young William Shakespeare probably read Cicero, Virgil, Ovid, Terence, Plautus, and Seneca. In those days school began at six or seven in the morning and lasted until five or six in the evening. After the long school day and during holidays, the young Shakespeare certainly became familiar with the beautiful countryside around Stratford, as is shown by the many references to rural sights and sounds in his plays. It was easy for him to go to the country, for his father's home in Henley Street was only about two hundred yards from the open fields. Sometime in his youth Shakespeare must have acquired an amazing knowledge of field sports, hunting, hawking, and woodcraft, for his plays show a fuller knowledge of sports than the plays of any other dramatist of his time. It is easy to imagine the lad escaping from Stratford and following the neighboring gentry as they roamed the countryside with their hawks and hounds.

**Marriage.** When Shakespeare was thirteen or fourteen, his father began having financial difficulties, which continued the rest of his life. According to Shakespeare's first biographer (who did not write until nearly one hundred years after the poet's death) the boy was taken from school because of these difficulties, and it is said that he was apprenticed to a Stratford tradesman. This story is probable enough, considering the position of the family and the customs of the town, but there is no definite record of Shakespeare until November 27, 1582. On that date a license was issued for his marriage to Anne Hathaway, the daughter of a farmer who lived about a half mile west of Stratford at Shottery. At the time, William was eighteen and Anne twenty-six.

The only other definite records of William's early life in Stratford are those of the baptism of his children, Susanna on May 26, 1583, and the twins Hamnet and

Judith on February 2, 1585. When or why he left Stratford is not definitely known. One story, which was told more than a hundred years later, tells that he was caught poaching, or stealing deer, in the deer park of Sir Thomas Lucy, a justice of the peace and member of Parliament, and was prosecuted. In revenge, it is said that he wrote a scandalous ballad about Sir Thomas, was prosecuted further, and had to leave Stratford. Another story, first recorded about fifty years after Shakespeare's death, says that he was a schoolmaster before he went to London. Actually, there is no definite evidence of what happened to him between 1584, when the twins were born, and 1592, when he was acting and writing plays in London. These years are sometimes called "the lost years."

**Actor and Playwright.** Evidently at some time during this period Shakespeare came to London and became a man of the theater. No one knows how his career began. One legend says that he began as a callboy, still another that he was a minor actor. But all that is definitely known is that by 1592 he was recognized as an actor and a playwright. In that year the brilliant poet and dramatist, Robert Greene, wrote on his deathbed a sensational pamphlet called *Greene's Groatsworth* (eight cents' worth) of *Wit Bought with a Million of Repentance*. In it he bitterly attacked Shakespeare as an upstart actor and playwright who thought himself as good as the university-trained dramatists. Soon afterward Greene died, and the pamphlet was edited by his friend Henry Chettle, who did not know Shakespeare. Two or three months later, Chettle met Shakespeare and heard about him from various friends. He then published an apology. He praised Shakespeare as an actor, writer, and man of "civil" behavior, and expressed regret that he had not suppressed his envious friend's pamphlet. Greene's attack and Chettle's apology make it apparent that by the end of 1592 Shakespeare was fairly well known in London as an actor and playwright, that he had influential friends, and that his success in the theater had been great enough to rouse the envy of at least one of his rivals.

**Poet.** From the summer of 1592 to the summer of 1594, plagues and riots kept the London theaters closed most of the time, so Shakespeare turned to writing non-dramatic verse. During this period, he published two long narrative poems, *Venus and Adonis* and *The Rape of Lucrece*. Both of these became very popular and added tremendously to his reputation. They were his first works to be published, and thus the first to reach an audience which could not or would not attend the popular London theaters. In the eyes of many Englishmen of the 1590's, plays had little more claim to literary distinction than motion-picture scenarios do today. Shakespeare himself was probably not entirely free from this strange prejudice, for *Venus and Adonis* and *Lucrece* were the only works whose publication he carefully supervised himself, and the only ones for which he wrote dedications. Both are dedicated to Henry Wriothesley, Earl of Southampton. Because of this fact, the Earl is often spoken of as Shakespeare's patron.

**Theater Companies.** Historians do not know definitely to what particular theatrical company Shakespeare belonged in the years before 1594. Plays in



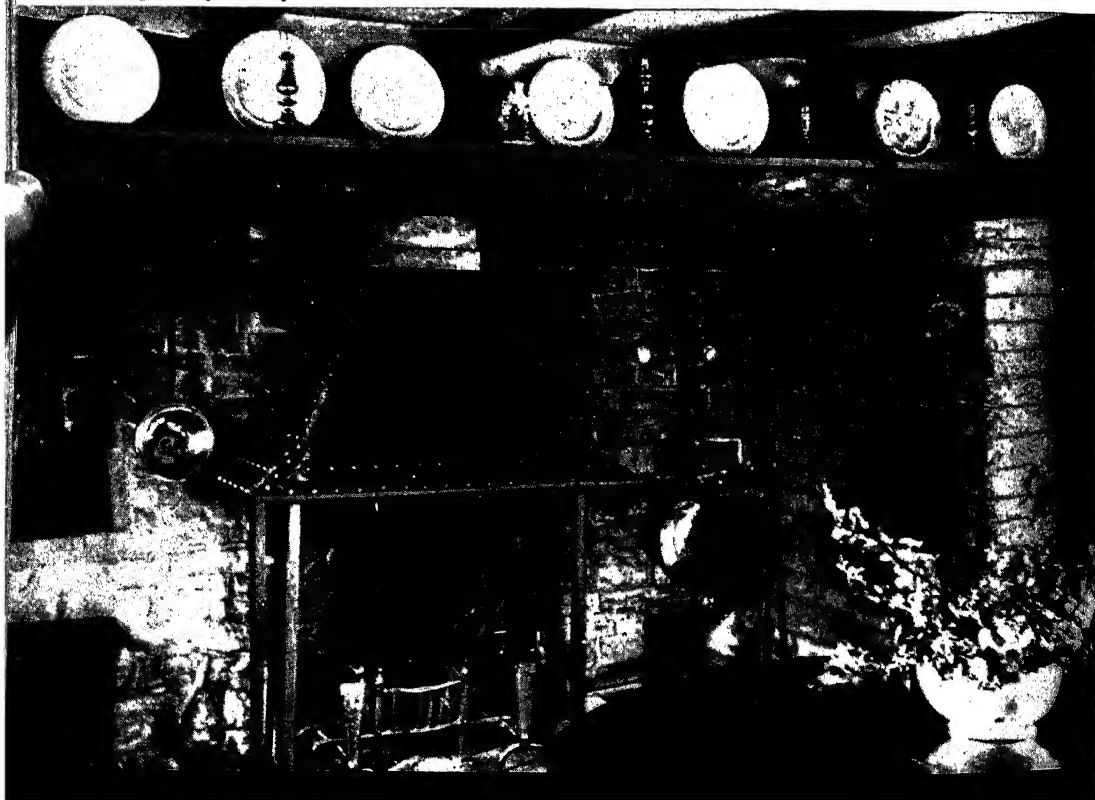


#### ANNE HATHAWAY'S COTTAGE

*Above:* This picturesque cottage is the birthplace of Anne Hathaway who became Shakespeare's wife. It is located at the village of Shottery about a mile from Stratford-on-Avon. It has half-timbered walls, a roof thatched with straw, and small dormer windows. Three chimneys rise above the roof. In front of the cottage is a typical English garden of flowers, shrubs, and vegetables. The Hathaway house, restored and still sturdy and well-preserved, is said to be the most photographed in all England. Today, it is used as a museum and is furnished much as it is thought to

have been furnished during the poet's courtship days. Thousands of tourists and admirers of Shakespeare's plays visit this simple, but world-famous cottage. *Below:* The living room of the Hathaway home, showing the hooded fireplace, grate, and andirons. Notice the unplastered brick walls, the warming pans hanging on either side of the fireplace, and the chinaware and candlesticks displayed on the mantel. In most houses of the day, there was a baking oven set in the wall close to the fireplace. In such ovens bread and other foods were baked for the family.

Photos: Folger Shakespeare Library



## SHAKESPEARE, WILLIAM

Shakespeare's time were performed by permanent repertory companies. The same cast of men and boys presented a variety of plays in the same theater week after week. These groups were commercial organizations which depended for their income on the admissions paid by the audiences. The group to which Shakespeare belonged from 1594 to the end of his career was called the Lord Chamberlain's Company, until King James came to the throne in 1603. Later it had the honor of the patronage of the king himself and was known as the King's Company. Shakespeare was one of the leaders and stockholders in this organization, which became the most prosperous theatrical troupe in London. His income was obviously quite a respectable one in the latter part of his life. It apparently came from his share in the profits, for in his time no dramatist received very much money from the sale of either the acting or publishing rights to his plays and poems.

**Financial Success.** Various records show that Shakespeare made a small fortune. In 1596 he owned enough property in the London parish of St. Helen's, Bishopsgate, to have to pay five pounds in taxes, a large sum in those days. The next year he bought one of the finest houses in Stratford and improved it and the grounds until it became one of the show places of the town. It had ten fireplaces and, after his death, while his daughter was living there, it was selected as the residence of Charles I's queen during her visit to Stratford for a few days. In 1598 he bought 10 per cent of the stock in the handsome Globe Theater and, ten years later, 14 per cent of the stock in the Blackfriars Theater. In 1602 he bought one hundred acres of land near Stratford and leased a cottage and another plot of ground in the town. Three years later he purchased valuable property in the town of Stratford, and in 1613 another house in a fashionable section of London. These real estate dealings are not significant in themselves, but, taken together, they show the prosperity which Shakespeare achieved through his theatrical activities.

The years from 1594 to about 1608 were the most productive years of Shakespeare's career. He must have been a familiar figure about London, but only a few records of his specific activities have survived. In 1599, probably upon Shakespeare's application, the College of Heralds granted his father a coat of arms. This was made up of a gold shield bearing a silver falcon shaking a golden spear.

**Activities.** In the same year, a man named William Wayte claimed that Shakespeare and certain other men had put him in fear of death. Little is known of this particular dispute except that it was part of a long quarrel in which Shakespeare was not personally involved. In 1598 and 1603, Shakespeare acted in two of Ben Jonson's plays which were produced by his company. With his fellow actors, he marched in King James' royal entrance parade into London in 1604. Between 1602 and 1612 he was a fairly close friend of a family of French refugees named Mountjoy, and during some part of this period he lived in their house. When Mary Mountjoy's husband sued her father about Mary's dowry in 1612, Shakespeare, then living at Stratford, was called as a witness and told what he remembered of the arrangements for the marriage.

## SHAKESPEARE, WILLIAM

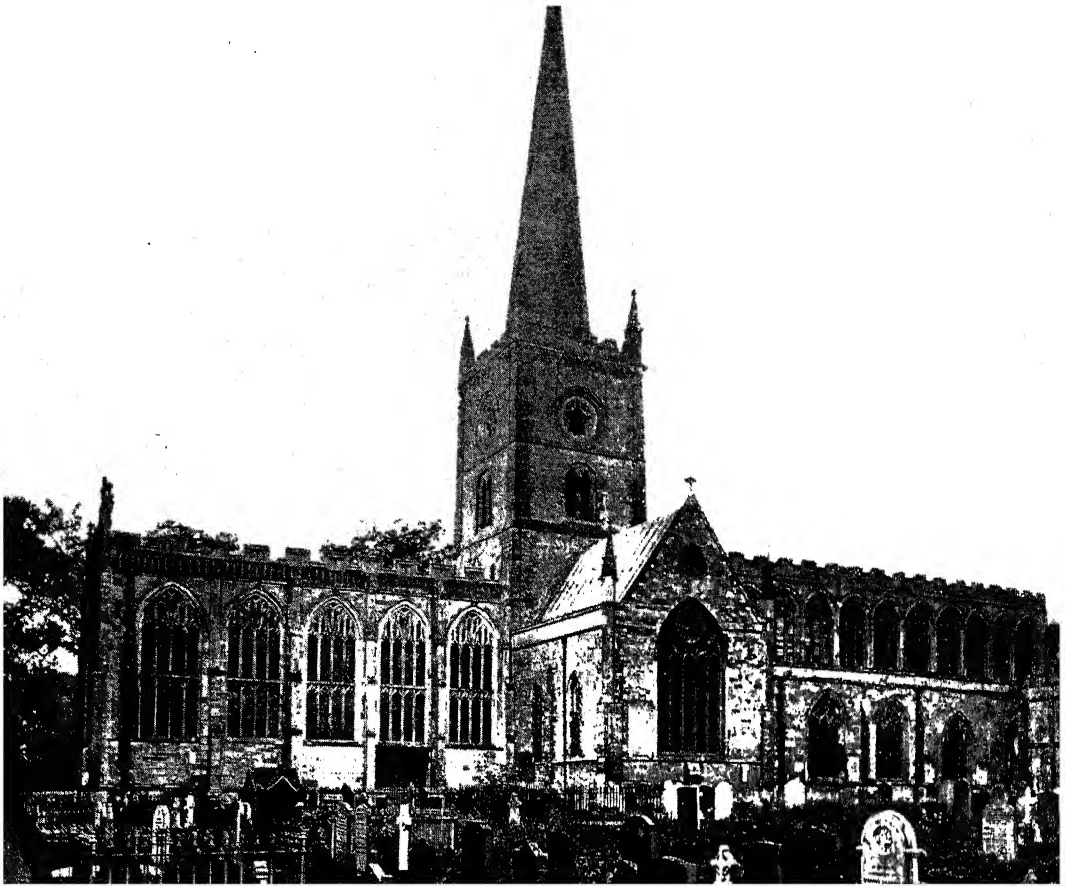
These few fragmentary records give no real picture of Shakespeare's activities in London. They are merely incidental facts which happen to have been preserved for more than three centuries. Shakespeare's days were chiefly occupied with affairs of the theater. In addition to the great labor of writing his own plays, he was regularly acting in the company's performances and rewriting and revising old plays. He must have been extremely busy — rehearsing in the mornings, acting in the afternoons, writing and revising plays at night and in odd hours, and attending to his various business affairs whenever he could. It has been suggested that this severe strain led to some kind of breakdown in 1608, and there is evidence that Shakespeare's activities changed in that year. Before then, he seems to have furnished his company with about two plays a year, but after that date not more than five plays can be credited to him in the seven years before his death, and he wrote two or three of them with other dramatists.

**Later Years.** Shakespeare's company bought the fashionable Blackfriars Theater in 1608 and from then on performed there in the winter and at the Globe during the summer. From that time on, Shakespeare probably retired more and more from regular acting and writing for the company. After 1612 he seems to have spent most of his time in Stratford, although he was back in London now and again. Perhaps he was there in 1613 when the Globe burned during a performance of his *Henry VIII*. Certainly he had stock in the new Globe which was built immediately on the site of the old theater.

Shakespeare was at Stratford during his last illness. On March 25, 1616, he called in his lawyer, Francis Collins, to revise his will. In it he remembered various friends, including his old fellow actors of the King's Company in London, John Heminges, Henry Condell, and Richard Burbage, and his Stratford neighbors such as Hamlet Sadler and John Nashe. As was usual at the time, he tried to keep most of his property together to form an estate for his direct descendants. In his case they were the children of his two daughters. Again, like more Englishmen of the day, he liked to think that his property would serve his descendants for generations. But in this he failed, for all his grandchildren died childless and his last direct descendant died in 1670.

Shakespeare himself died at the age of fifty-two, on April 23, 1616. As a prominent citizen of the town, he was buried inside the chancel of Holy Trinity Church. On the flat stone over his grave were carved the lines sometimes described as his epitaph, but which are nothing of the kind. They are simply a device to prevent the disturbing of the grave. It is easy to understand that in English churches, where people were buried under the floor of the church year after year for centuries, the space was sooner or later filled. When it was, the sexton removed the bones of those who had long since been forgotten and tossed them unceremoniously into the charnel house where dead bodies and bones were kept. (The one at Stratford opened off the north side of the chancel, only a few feet from Shakespeare's grave.)

New burials were then made in the space thus made available. Evidently Shakespeare, like others, was distressed by this practice, for the lines carved on his grave-stone are nicely designed to keep any superstitious



**Shakespeare's Tomb** is in Holy Trinity Church, in the town of Stratford-on-Avon. He was baptized in this church and

sexton from disturbing the grave (see illustration below).

**Portraits.** Some time before 1623, a bust of the dramatist was placed on the wall of the church. It was made

SAKE FORBEARE,  
DYST EN  
IE Y AN Y SPARES THE  
HE Y MOVES MY BONES.

#### The Lines Carved on William Shakespeare's Tombstone

after his death by a London tombmaker named Johnson or Janssen, and not by a sculptor, so there is no reason to think that it is a good likeness. The best-known portrait of the playwright is the engraving by Martin Droeshout, which appeared in the first folio of Shakespeare's plays in 1623. Since Droeshout was only fifteen years old when the poet died and Shakespeare could not have sat for the portrait, there can be no complete confidence in its likeness. There is even some evidence that Droeshout made use of the Stratford bust in preparing his engraving. Still, unsatisfactory as the bust and the engraving are, they are the most authentic likenesses we have of Shakespeare.

Besides these two, many so-called portraits of Shakespeare have turned up from time to time, but all are doubtful. In some cases there is no evidence that they

now lies under the floor of the chancel. His wife and other members of the family are also buried here.

were ever intended to be portraits of Shakespeare. They are simply pictures of unknown men of the time. Others were painted after Shakespeare's death, but not by men such as Droeshout or Johnson, who are known to have been hired by Shakespeare's heirs, associates in the theater, and friends.

#### Shakespeare's Works

Shakespeare was a professional dramatist who made his income directly from the theater, and associated daily with actors. He wrote his plays to suit the tastes of the theater audience. He was not an originator. He did not introduce new types of plays as did Thomas Kyd, Christopher Marlowe, or Ben Jonson. He wrote to meet the demands of the actors for plays of a type that was already popular. Nine of his ten historical dramas were written during a period when such plays were in greatest vogue. All six of his greatest tragedies were written when tragedy was most popular. His dramatic romances or tragicomedies were completed when plays of that type were succeeding on the stage. Like so many artists of the greatest genius, he was content to meet the demands of his time. He exercised his genius not in creating new forms but in taking the fullest advantage of the possibilities of whatever form was popular.

**Periods of Development.** In studying the work of any

great artist — painter, sculptor, musician, or writer — his admirers always want to know the order in which his works were created so that they may observe the development of his genius. Scholars have long tried to learn the dates of Shakespeare's various plays so that they might study the development of his genius. They have not yet been completely successful, but it is now possible to be reasonably sure of the approximate dates of most of them. There were four major periods in Shakespeare's development. The first began with his arrival in London and continued until about 1594 or 1595. The second period lasted until about 1600 or 1601, the third until 1608, and the last until he gave up writing for the stage three or four years before his death.

The first period was definitely one of experimentation. Several of these early plays are revisions of other men's work. All contain experiments in verse forms, in types of situations, and in kinds of dramatic appeal.

The plays of the first period are of various types — tragedy, comedy, history, and farce.

During the second period, Shakespeare used the tools of the playwright and poet much more surely. He seldom failed to get the effect he wanted, and he confined himself mostly to light comedies and histories.

In the third period of his development all his greatest tragedies were written — *Hamlet*, *Othello*, *King Lear*, *Macbeth*, *Antony and Cleopatra*, and *Coriolanus* — as well as the "bitter comedies" or "problem comedies." This is the period of his most mature work. His purpose is deeply serious. His characters are the most profound and subtle creations ever seen on any stage. His blank verse and prose are made into the most effective dramatic instrument ever created. No other writer has produced in the short period of seven or eight years so many works which may truly be called masterpieces.

The fourth period of Shakespeare's work contains the smallest number of plays and shows a sharp falling off in the intensity of his dramatic romances or tragicomedies. The most representative plays of the fourth period are *The Tempest*, *The Winter's Tale*, and *Cymbeline*. They combine something of the lightness of *As You Like It* and *Twelfth Night* with more serious situations. In them Shakespeare is still the dramatic master and great poet, but though he seems more eager than ever to pack his lines with meaning, something of his earlier liveliness is gone.

**Types of Plays.** In general, Shakespeare's plays fall into three classes, as was indicated in the first collected edition, the folio of 1623, which was entitled *Mr. William Shakespeare's Comedies, Histories, and Tragedies*.

**Histories.** The histories, which are sometimes called chronicle plays, are the type least familiar today, for they long ago ceased to be written. But they were very popular in Shakespeare's time. More than one hundred and fifty of them appeared, and nearly one third of Shakespeare's own plays were written in this form. They were not simply pictures of heroic figures seen against historic or "period" backgrounds, like the modern play, *Abe Lincoln in Illinois*. Rather, they were plays in which the history came first. Their aim was to satisfy the demand of the London audience for stories about the past. They were really "pieces out of the story of England dramatized and set on the stage." The audience wanted to see

not simply a play with a great king like Henry V in it, but a presentation of what had actually happened when Henry V was king. Thus the chronicle plays tended to include all the well-known events of a reign for the delight of an historical-minded audience. In addition, all such plays took for granted that the audience had a fair knowledge of English history. For this reason the average modern reader does not always understand some of the action.

The Elizabethan historical plays deal with most periods of English history from 950 to 1603, but Shakespeare was interested particularly in the period from about 1397 to 1485. Eight of his ten historical plays are concerned with this period, and picture the reigns of seven successive kings of England — Richard II, Henry IV, Henry V, Henry VI, Edward IV, Edward V, and Richard III.

**Tragedies.** Shakespeare's tragedies belong to a type of play which is fairly familiar today, for not only is tragedy still regularly performed in our theaters, but most modern tragedies have been decidedly influenced by Shakespeare. Confusion about his tragedies occasionally arises because it is easy to forget that the Elizabethans made no distinction between tragedy and melodrama. In those days, any play which involved catastrophes and violent death for important characters was called a tragedy, regardless of how superficial or melodramatic it was. Thus Shakespeare's *Titus Andronicus* was called a tragedy, although it would generally be labeled melodrama today.

**Comedies.** Shakespeare's comedies show greater variety than his histories and tragedies. Most familiar are *As You Like It*, *Twelfth Night*, and *A Midsummer Night's Dream*. These were light romantic pieces, highly fanciful and improbable in plot. He also wrote plays which would now be called farces, although the term was not in common use in Elizabethan England. Among these are *The Comedy of Errors* and *The Taming of the Shrew*. *The Merry Wives of Windsor*, a popular comedy, also has a large element of farce. It would probably be advertised as a farce-comedy if it had been written for the modern stage. Least familiar to most readers are Shakespeare's bitter comedies or problem comedies — *All's Well that Ends Well*, *Measure for Measure*, and *Troilus and Cressida*. These plays were cynical, inconclusive, and unsatisfactory in their endings. They are the most puzzling of Shakespeare's dramatic works. Still later in his career came the romances or tragicomedies — *The Tempest*, *The Winter's Tale*, and *Cymbeline*, each a mixture of romance, melodrama, and near-tragedy.

**Plots.** Regardless of type, most of Shakespeare's plays have plots based upon his own reading of history or fiction. The Elizabethan custom of using old plots instead of inventing new ones often puzzles modern readers who are inclined to consider the plot of a play its most important element. Actually most of the world's greatest dramatists, such as Aeschylus, Sophocles, Euripides, Shakespeare, and Racine, have used secondhand plots. Even in modern times, dramatists like Eugene O'Neill and Maxwell Anderson sometimes deliberately call attention to the fact that their plots are not original. In all ages, the great dramatists portray the eternal realities in the struggles of men with circumstances or fate. To

## THE FIRST PERIOD

PROBABLE DATE OF FIRST PERFORMANCE*	TITLE	DATE OF PUBLICATION	CHIEF SOURCE
1590-1592	Henry VI, Part II	1594	Holinshed, <i>Chronicles</i>
1590-1592	Henry VI, Part III	1595	Holinshed, <i>Chronicles</i>
1590-1592	Henry VI, Part I	1623	Holinshed, <i>Chronicles</i>
1591-1593	The Comedy of Errors	1623	Plautus, <i>Menæchmi</i> and <i>Amphitruo</i>
1593-1594	Titus Andronicus	1594	Uncertain
1593-1594	Richard III	1597	Holinshed, <i>Chronicles</i>
1592-1595	Love's Labour's Lost	1598	Unknown
1594-1597	The Taming of the Shrew	1623	Anon., <i>The Taming of a Shrew</i> ; Ariosto, <i>I Suppositi</i>
1591-1594	The Two Gentlemen of Verona	1623	Montemayor, <i>Diana Enamorada</i>

## THE SECOND PERIOD

1594-1597	Romeo and Juliet	1597	Brooke, <i>The Tragicall Historie of Romeo and Juliet</i>
1595-1596	Richard II	1597	Holinshed, <i>Chronicles</i>
1594-1596	A Midsummer Night's Dream	1600	No single comprehensive source
1596-1597	King John	1623	Anon., <i>The Troublesome Raigne of John, King of England</i>
1595-1596	The Merchant of Venice	1600	Fiorentino, <i>Il Pecorone</i>
1597-1598	Henry IV, Part I	1598	Holinshed, <i>Chronicles</i> ; an old play, <i>The Famous Victories of Henry V</i>
1598-1601	The Merry Wives of Windsor	1602	Unknown
1597-1598	Henry IV, Part II	1600	Holinshed, <i>Chronicles</i> ; and <i>The Famous Victories of Henry V</i>
1598-1599	Much Ado About Nothing	1600	Belleforest, <i>Histoires Tragiques</i> ; Ariosto, <i>Orlando Furioso</i> , Canto V
1599	Henry V	1600	Holinshed, <i>Chronicles</i>
1599	Julius Caesar	1623	Plutarch, <i>Lives</i>
1599-1600	As You Like It	1623	Lodge, <i>Rosalynde</i>
1599-1601	Twelfth Night	1623	Riche, Apolonius and Silla

## THE THIRD PERIOD

1600-1602	Hamlet	1603	The early play of <i>Hamlet</i> ; Belleforest, <i>Histoires Tragiques</i>
1601-1603	Troilus and Cressida	1609	Various popular medieval accounts of the story of Troy
1601-1604	All's Well that Ends Well	1623	Painter, <i>Palace of Pleasure</i>
1603-1604	Measure for Measure	1623	Whetstone, <i>Promos and Cassandra</i>
1604	Othello	1622	Cinthio, <i>Hecatommithi</i>
1605-1606	King Lear	1608	Anon., <i>Chronicle History of King Lear</i> ; various popular accounts, and Sidney's <i>Arcadia</i>
1605-1606	Macbeth	1623	Holinshed, <i>Chronicles</i>
1606-1608	Anthony and Cleopatra	1623	Plutarch, <i>Lives</i>
1608-1610	Coriolanus	1623	Plutarch, <i>Lives</i>
1605-1609	Timon of Athens	1623	Plutarch, <i>Lives</i> ; Lucian, <i>Timon</i>

## THE FOURTH PERIOD

1607-1609	Pericles	1609	Gower, <i>Confessio Amantis</i>
1609-1610	Cymbeline	1623	Boccaccio, <i>Decameron</i> ; Holinshed, <i>Chronicles</i>
1610-1611	The Winter's Tale	1623	Greene, Pandosto
1610-1611	The Tempest	1623	No comprehensive source
1613	Henry VIII	1623	Holinshed, <i>Chronicles</i> ; Foxe, <i>Book of Martyrs</i>

\*Dates are a consensus of leading experts.



them, plot originality is of little basic importance.

In his search for stories and ideas for effective plays, Shakespeare used a number of books which were widely read in his time. Chief of these were a popular history written by Raphael Holinshed called *Chronicles of England, Scotland, and Ireland* and Lord North's translation of *The Parallel Lives of the Noble Grecians and Romans* by Plutarch.

**Characters.** Whatever the source of his plot, Shakespeare makes the material completely his own. He adds, omits, and changes, until the original source becomes no more than a fragmentary skeleton about which he has formed a living work of art. This is especially true of his great characters, such as Shylock, Falstaff, Macbeth, Hamlet, Rosalind, Richard II, Beatrice, Brutus, King Lear, Mark Antony, and Iago. In every case Shakespeare's imagination has created a living man or woman from the dry bones found in the source. So vivid are these characters in the minds of educated people that their names have become symbols for types of people and ideas. People speak of "Falstaffian humor," of a confirmed bachelor as "a Benedick," of a vicious money-grubber as a "Shylock," of a youthful lover as a "young Romeo," and of a small-town policeman as "the local Dogberry."

#### Famous Quotations

Not only the names of the characters, but also many of their speeches have passed into general usage. These speeches express so accurately the thoughts and feelings of men and women born long after Shakespeare's day that they have become familiar quotations. Shakespeare is endlessly quoted by writers and speakers of all sorts and in various circumstances. Newspaper editorials are headed by such quotations. Politicians and public speakers use his words constantly. Books carry his lines on their title pages, and novels and plays are given titles taken from his works. In one year seven different books appeared, each with a title taken from one short speech in *Macbeth*. No other writer in the world is so frequently quoted. A standard book of familiar quotations gives five times as much space to Shakespeare as to the next most widely quoted author. Among the most frequently repeated of the lines spoken by Shakespeare's characters are these:

Now is the winter of our discontent  
Made glorious summer by this sun of York.  
*King Richard III. Act I, Sc. 1, 1-2*

I have no other but a woman's reason:  
I think him so because I think him so.  
*Two Gentlemen of Verona. Act I, Sc. 2, 23-24*

He jests at scars, that never felt a wound.  
*Romeo and Juliet. Act II, Sc. 2, 1*

What's in a name? That which we call a rose  
By any other name would smell as sweet.  
*Romeo and Juliet. Act II, Sc. 2, 43-44*

Romeo. Courage, man. The hurt cannot be much.  
Mercutio. No, 'tis not so deep as a well, nor so wide as a church door; but 'tis enough, 'twill serve.  
*Romeo and Juliet. Act III, Sc. 1, 98-100*

A plague o' both your houses!  
*Romeo and Juliet. Act III, Sc. 1, 103*

This royal throne of kings, this scepter'd isle,  
This earth of majesty, this seat of Mars,

This other Eden, demi-paradise,  
This fortress built by Nature for herself  
Against infection and the hand of war,  
This happy breed of men, this little world,  
This precious stone set in the silver sea,  
Which serves it in the office of a wall,  
Or as a moat defensive to a house,  
Against the envy of less happier lands;  
This blessed plot, this earth, this realm, this England.  
*King Richard II. Act II, Sc. 1, 40-50*

I see thy glory, like a shooting star,  
Fall to the base earth from the firmament.  
*King Richard II. Act II, Sc. 4, 19-20*

For aught that I could ever read,  
Could ever hear by tale or history,  
The course of true love never did run smooth.  
*A Midsummer Night's Dream. Act I, Sc. 1, 131-134*

Life is as tedious as a twice-told tale  
Vexing the dull ear of a drowsy man.  
*King John. Act III, Sc. 4, 108-109*

Come the three corners of the world in arms,  
And we shall shock them. Naught shall make us rue  
If England to itself do rest but true.  
*King John. Act V, Sc. 7, 116-118*

I hold the world but as the world, Gratiano—  
A stage, where every man must play a part,  
And mine a sad one.  
*The Merchant of Venice. Act I, Sc. 1, 77-79*

I am Sir Oracle,  
And when I ope my lips, let no dog bark!  
*The Merchant of Venice. Act I, Sc. 1, 93-94*

God made him, and therefore let him pass for a man.  
*The Merchant of Venice. Act I, Sc. 2, 55-56*

The devil can cite Scripture for his purpose.  
*The Merchant of Venice. Act I, Sc. 3, 97*

The quality of mercy is not strain'd;  
It droppeth as the gentle rain from heaven  
Upon the place beneath. It is twice blest—  
It blesseth him that gives, and him that takes.  
*The Merchant of Venice. Act IV, Sc. 1, 183-186*

How far that little candle throws his beams!  
So shines a good deed in a naughty world.  
*The Merchant of Venice. Act V, Sc. 1, 90-91*

By heaven, methinks it were an easy leap  
To pluck bright honour from the pale-fac'd moon,  
Or dive into the bottom of the deep,  
Where fathom-line could never touch the ground,  
And pluck up drowned honour by the locks.  
*Henry IV, Part I. Act I, Sc. 3, 201-205*

Uneasy lies the head that wears a crown.  
*Henry IV, Part II. Act III, Sc. 1, 31*

Every one can master a grief but he that has it.  
*Much Ado about Nothing. Act III, Sc. 2, 26*

Let me have men about me that are fat,  
Sleek-headed men, and such as sleep a-nights.  
Yond Cassius has a lean and hungry look.  
He thinks too much. Such men are dangerous.  
*Julius Caesar. Act I, Sc. 2, 192-195*

#### The Illustrations

Most of the illustrations in this article, taken from books published before 1641, were selected for the WORLD BOOK ENCYCLOPEDIA with the assistance of the Folger Shakespeare Library, Washington, D.C.

For there was never yet philosopher  
That could endure the toothache patiently.  
*Much Ado about Nothing. Act V, Sc. 1, 35-36*

Men at some time are masters of their fates.  
The fault, dear Brutus, is not in our stars,  
But in ourselves, that we are underlings.  
*Julius Caesar. Act I, Sc. 2, 139-141*

Cowards die many times before their deaths;  
The valiant never taste of death but once.  
*Julius Caesar. Act II, Sc. 2, 32-33*

There is a tide in the affairs of men  
Which, taken at the flood, leads on to fortune;  
Omitted, all the voyage of their life  
Is bound in shallows and in miseries.  
*Julius Caesar. Act IV, Sc. 3, 217-220*

His life was gentle, and the elements  
So mix'd in him that Nature might stand up  
And say to all the world, "This was a man!"  
*Julius Caesar. Act V, Sc. 5, 73-75*

O, how full of briers is this working-day world!  
*As You Like It. Act I, Sc. 3, 12*

Sweet are the uses of adversity,  
Which, like the toad, ugly and venomous,  
Wears yet a precious jewel in his head;  
And this our life, exempt from public haunt,  
Finds tongues in trees, books in the running brooks,  
Sermons in stones, and good in everything.  
*As You Like It. Act II, Sc. 1, 12-17*

Ay, now am I in Arden, the more fool I!  
When I was at home, I was in a better place; but  
travellers must be content.  
*As You Like It. Act II, Sc. 4, 13-15*

I shall ne'er be ware of mine own wit till I break my  
shins against it.  
*As You Like It. Act II, Sc. 4, 54-55*

If ladies be but young and fair,  
They have the gift to know it.  
*As You Like It. Act II, Sc. 7, 37-38*

True is it that we have seen better days.  
*As You Like It. Act II, Sc. 7, 120*

All the world's a stage,  
And all the men and women merely players.  
They have their exits and their entrances,  
And one man in his time plays many parts.  
*As You Like It. Act II, Sc. 7, 139-142*

I had rather have a fool to make me merry than  
experience to make me sad.  
*As You Like It. Act IV, Sc. 1, 25-27*

Men have died from time to time, and worms have  
eaten them, but not for love.  
*As You Like It. Act IV, Sc. 1, 99-100*

How bitter a thing it is to look into happiness through  
another man's eyes!  
*As You Like It. Act V, Sc. 2, 42-43*

Your "If" is the only peacemaker. Much virtue in "If."  
*As You Like It. Act V, Sc. 4, 99-100*

If music be the food of love, play on,  
Give me excess of it, that, surfeiting,  
The appetite may sicken, and so die.  
*Twelfth Night. Act I, Sc. 1, 1-3*

Dost thou think, because thou art virtuous, there shall  
be no more cakes and ale?  
*Twelfth Night. Act II, Sc. 3, 116-117*

She never told her love,  
But let concealment, like a worm i' th' bud,  
Feed on her damask cheek. She pin'd in thought;  
And, with a green and yellow melancholy,  
She sat like Patience on a monument,  
Smiling at grief.

*Twelfth Night. Act II, Sc. 4, 111-116*

Some are born great, some achieve greatness, and some  
have greatness thrust upon 'em.

*Twelfth Night. Act II, Sc. 5, 149-151*

O that this too too solid flesh would melt,  
Thaw, and resolve itself into a dew!  
Or that the Everlasting had not fix'd  
His canon 'gainst self-slaughter! O God! God!  
How weary, stale, flat, and unprofitable  
Seem to me all the uses of this world!

*Hamlet. Act I, Sc. 2, 129-134*

Neither a borrower nor a lender be;  
For loan oft loses both itself and friend,  
And borrowing dulls the edge of husbandry.

*Hamlet. Act I, Sc. 3, 75-77*

This above all—to thine own self be true,  
And it must follow, as the night the day,  
Thou canst not then be false to any man.

*Hamlet. Act I, Sc. 3, 78-80*

There are more things in heaven and earth, Horatio,  
Than are dreamt of in your philosophy.

*Hamlet. Act I, Sc. 5, 166-167*

The time is out of joint. O cursed spite  
That ever I was born to set it right!

*Hamlet. Act I, Sc. 5, 189-190*

Ay, every inch a king!

*King Lear. Act IV, Sc. 6, 109*

Sleep that knits up the ravell'd sleeve of care.

*Macbeth. Act II, Sc. 2, 37*

Tomorrow, and tomorrow, and tomorrow  
Creeps in this petty pace from day to day  
To the last syllable of recorded time;  
And all our yesterdays have lighted fools  
The way to dusty death. Out, out, brief candle!  
Life's but a walking shadow, a poor player,  
That struts and frets his hour upon the stage  
And then is heard no more. It is a tale  
Told by an idiot, full of sound and fury,  
Signifying nothing.

*Macbeth. Act V, Sc. 5, 19-28*

There's beggary in the love that can be reckon'd.

*Antony and Cleopatra. Act I, Sc. 1, 15*

In nature's infinite book of secrecy

A little I can read.

*Antony and Cleopatra. Act I, Sc. 2, 9-10*

Age cannot wither her nor custom stale  
Her infinite variety.

*Antony and Cleopatra. Act II, Sc. 2, 240-241*

Golden lads and girls all must,  
As chimney sweepers, come to dust.

*Cymbeline. Act IV, Sc. 2, 202-203*

We are such stuff  
As dreams are made on, and our little life  
Is rounded with a sleep.

*The Tempest. Act IV, Sc. 1, 156-158*

There's a divinity that shapes our ends,  
Rough-hew them how we will.

*Hamlet. Act V, Sc. 2, 10-11*

The rest is silence.

*Hamlet. Act V, Sc. 2, 306*



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**London Bridge Was Lined with Houses** and resembled a street during Shakespeare's time. People going to the theater district either went by boat or crossed the bridge by means

of an arcade which ran through the buildings. The houses were torn down when the bridge became unsafe, and this destruction inspired the famous "London Bridge Is Falling Down."

To be, or not to be—that is the question:  
Whether 'tis nobler in the mind to suffer  
The slings and arrows of outrageous fortune  
Or to take arms against a sea of troubles,  
And by opposing end them. To die—to sleep—  
No more; and by a sleep to say we end  
The heartache, and the thousand natural shocks  
That flesh is heir to. 'Tis a consummation  
Devoutly to be wish'd. To die—to sleep.  
To sleep—perchance to dream; ay, there's the rub!  
For in that sleep of death what dreams may come  
When we have shuffled off this mortal coil,  
Must give us pause. There's the respect  
That makes calamity of so long life.  
For who would bear the whips and scorns of time,  
Th' oppressor's wrong, the proud man's contumely,  
The pangs of despis'd love, the law's delay,  
The insolence of office, and the spurns  
That patient merit of th' unworthy takes,  
When he himself might his quietus make  
With a bare bodkin? Who would these fardels bear,  
To grunt and sweat under a weary life,  
But that the dread of something after death—  
The undiscover'd country, from whose bourn  
No traveler returns—puzzles the will,  
And makes us rather bear those ills we have  
Than fly to others that we know not of?  
*Hamlet. Act III, Sc. 1, 56-82*

O, what a world of vile ill-favour'd faults  
Looks handsome in three hundred pounds a year!  
*The Merry Wives of Windsor. Act III, Sc. 4, 32-33*

One touch of nature makes the whole world kin.  
*Troilus and Cressida. Act III, Sc. 3, 175*

Off expectation fails, and most oft there  
Where most it promises.  
*All's Well that Ends Well. Act II, Sc. 1, 145-146*

Reputation, reputation, reputation! O, I have lost my  
reputation! I have lost the immortal part of myself,  
and what remains is bestial.  
*Othello. Act II, Sc. 3, 256-258*

O God, that men should put an enemy in their mouths  
to steal away their brains!  
*Othello. Act II, Sc. 3, 283-285*

Good name in man and woman, dear my lord,  
Is the immediate jewel of their souls.  
Who steals my purse steals trash; 'tis something, nothing;  
'Twas mine, 'tis his, and has been slave to thousands;  
But he that filches from me my good name  
Robs me of that which not enriches him  
And makes me poor indeed.  
*Othello. Act III, Sc. 3, 155-167*

Then must you speak  
Of one that lov'd not wisely, but too well;  
Of one not easily jealous, but, being wrought,  
Perplex'd in the extreme; of one whose hand  
(Like the base Indian) threw a pearl away  
Richer than all his tribe.  
*Othello. Act V, Sc. 2, 345-350*

How sharper than a serpent's tooth it is  
To have a thankless child!  
*King Lear. Act I, Sc. 4, 292-293*

#### Nondramatic Works

**Narrative Poems.** Besides his plays, for which he is most famous, Shakespeare left several nondramatic pieces. The first of these were the two long narrative poems, *Venus and Adonis* and *The Rape of Lucrece*.

*Venus and Adonis* tells the story of Venus's courtship of the indifferent Adonis. The poem is no longer widely read, but in Shakespeare's time it was one of his most

popular compositions. It went through more editions in his lifetime than any of his plays. To modern readers one of its most attractive characteristics is the beautiful setting of English fields and woods.

*The Rape of Lucrece* is a more serious piece of work than *Venus and Adonis*, but it is not much more widely read today. It tells the familiar story of the attack on the Roman matron Lucrece by Tarquin, and of Lucrece's suicide. The story itself is less significant than Shakespeare's interest in the conflict in Tarquin's mind.

**Sonnets.** By far the best and most famous of Shakespeare's nondramatic works are his *Sonnets*. They were probably written long before they were published in 1609, for they are referred to in 1598, and two of them were published in 1599. Like *Venus and Adonis* and *The Rape of Lucrece* and most of his plays, the sonnets represent a literary form which was popular during the reign of Queen Elizabeth. Numerous English poets who lived during this period, such as Edmund Spenser, Philip Sidney, Samuel Daniel, and Michael Drayton, had written sonnet cycles. These are long series of sonnets generally treating various phases of the poet's love for his mistress. Shakespeare followed other poets in writing his series of 154 sonnets, but his do not form a real cycle, for they deal with more than a single subject. Most of them are written to a young man, probably a nobleman and a beloved friend of the poet. They treat a number of subjects, including a dark lady with whom Shakespeare was in love, but who was unfaithful; a rival poet; advice to the friend to marry; affection for his friend; his long absence (presumably when Shakespeare was traveling with his company on the road); and especially they treat of Time and its ravages.

Since there is such world-wide interest in Shakespeare, many attempts have been made to identify the persons he mentioned in the sonnets — the dark lady, the rival poet, and the patron and friend. None of these attempts has been successful, although the dedications of *Venus and Adonis* and *The Rape of Lucrece* to the Earl of Southampton make it possible to think that he was the friend and patron whom Shakespeare addressed.

The fact that we cannot identify the persons of whom Shakespeare speaks in no way affects the greatness of the sonnets as poetry. No other sonnets in the English language are so beautifully made or so deeply moving. No poet has fitted his ideas into the strict sonnet form with so little effort. In reading the finest of the sonnets, such as the seventy-third, which follows, one is almost persuaded that the ideas actually came to the poet in sonnet form, so easily does he fit his thoughts to the structural requirements of the sonnet:

That time of year thou mayst in me behold  
When yellow leaves, or none, or few, do hang  
Upon those boughs which shake against the cold,  
Bare ruin'd choirs, where late the sweet birds sang.  
In me thou see'st the twilight of such day  
As after sunset fadeth in the West,  
Which by-and-by black night doth take away,  
Death's second self, that seals up all in rest.  
In me thou see'st the glowing of such fire  
That on the ashes of his youth doth lie,  
As the deathbed whereon it must expire,  
Consum'd with that which it was nourish'd by.  
This thou perceiv'st, which makes thy love more strong,  
To love that well which thou must leave ere long.

### Theories of Authorship

Shakespeare's unequalled accomplishment, and his reputation as the greatest literary genius the world has ever known, have led many to study his life in order to gain a fuller knowledge and understanding of him. But the few facts known about Shakespeare's life do not explain his genius. As a result some ill-informed but ardent admirers of Shakespeare's plays have been bitterly disappointed, and have declared that the actor Shakespeare from the town of Stratford-on-Avon could not have written these masterpieces. They have tried to find some man of Shakespeare's time whose life is better known and whose career better fits their notion of what the life of a literary genius ought to be. Among those to whom the authorship of the plays has been most popularly credited are Edward de Vere, Earl of Oxford; Francis Bacon, Viscount St. Albans; and William Stanley, Earl of Derby.

All kinds of arguments have been set forth in books and articles to show that one or another of these noblemen wrote the plays. Secret ciphers, curious engravings, revealing portraits, and cryptic allusions have been pointed to as proof that someone other than Shakespeare was the author. The writers who have adopted one or another of these theories, who are known as Baconians, Oxfordians, or anti-Stratfordians, have been sincere admirers of Shakespeare's plays, but not very well informed about Elizabethan life. All have assumed that the literary genius who wrote the plays would surely have excited biographical interest in the 1600's as he does today. Mark Twain, for instance, could not understand why, if Shakespeare wrote the plays, there were not as many stories printed about him in Stratford as there were about himself in Hannibal, Mo. But close students of Elizabethan life point out that other literary men of genius in Elizabethan times, like Christopher Marlowe and Edmund Spenser, left even fewer records of their lives than did Shakespeare. It is noteworthy that no important Shakespearean scholar has ever supported any of these anti-Stratfordian views.

### Shakespeare, a Man of His Own Time

Every man, from the greatest genius to the most lowly beggar, reflects the beliefs and the living conditions of his own time. Shakespeare is no exception to this universal law. Centuries after his death his plays are acted and read in most of the countries of the world, and his comments on men and women are so fitting that today he is quoted more often than any other writer. But he still remains a man of the Elizabethan Age, with the tastes and prejudices common to his time. "Elizabethan" is a confusing word, and is used with various meanings. Elizabethan literature is generally taken to mean not only the literature written when Elizabeth was on the throne from 1558 to 1603, but also that composed between 1579, when Spenser's *Shepherd's Calendar* was published, and 1625, when King James I died. Elizabethan drama is the term generally used to refer to plays appearing between Lyly's first comedy in 1584 and the closing of the theaters by law in 1642. Thus, Shakespeare is always called an Elizabethan writer although he actually lived the last quarter of his life under King James I. A full understanding of Shake-



There is much feasting in this moneth but few the better for it

AN ELIZABETHAN FEAST

Photo: Folger Shakespeare Library

In Shakespeare's day, tableware was much more simple than it is today. Although knives were common, there were no forks, and even spoons were a luxury. Because everyone at the table ate from the serving dishes, individual plates were unnecessary. The serving woman in the foreground is "mulling" ale over a fireplace.





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**Shakespeare Lived during the Elizabethan Age**, which took its name from Queen Elizabeth. His writings reflect the beliefs and living conditions of his own time, but many of his comments still fit modern circumstances.

speare depends on some knowledge of the conditions under which he lived and worked.

**Great Elizabethans.** The Elizabethan Age is one of heroic achievement in the history of the English-speaking peoples. Shakespeare was by no means the only great man in his time. In literature, no other period has been more brilliant. Edmund Spenser, Sir Philip Sidney, John Donne, the great poet and preacher, Ben Jonson, Christopher Marlowe, John Fletcher, and Francis Bacon all lived at the same time as Shakespeare. The period was one of exploration and great expansion on the sea, and Shakespeare may well have known such great captains as Sir Walter Raleigh, Sir Francis Drake, Martin Frobisher, John Hawkins, and Henry Hudson. In government such famous political figures as Francis Walsingham, William and Robert Cecil, and the great lawyer, Edward Coke, were all living in London when Shakespeare did. Queen Elizabeth herself, whom Shakespeare probably saw many times and before whom he acted at court, was one of the most brilliant rulers England ever had. Shakespeare was but one among many great figures of the day.

**London of Shakespeare's Day.** For Shakespeare, London was the heart of England as it was for all Elizabethans, especially for the dramatists. It was a city of about 200,000 people, but all the theaters, all but two of the printers and publishers, and most of the great merchants were established there. The Queen and

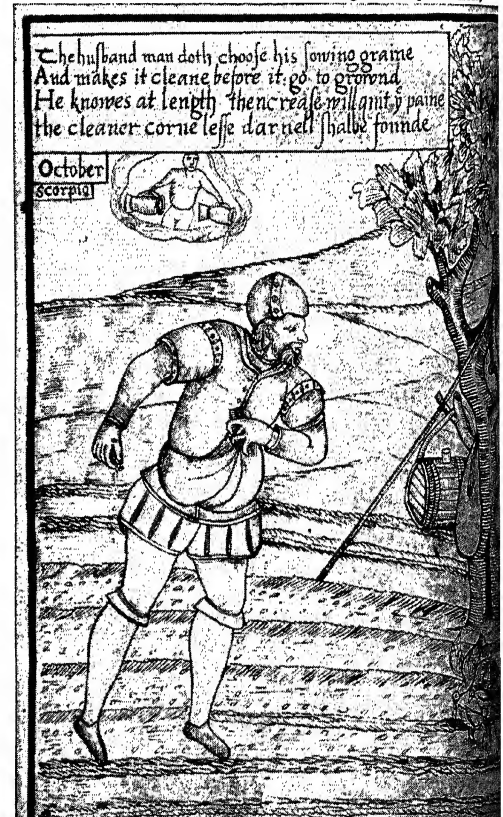
her court, with their dazzling display, were nearly always in and about London, and their presence not only lent the city such color as is to be found in no modern capital, but it also influenced the daily lives of the citizens. Yet, judged by modern standards, London was a dirty, crowded city, with open sewers and only a few cobblestoned streets. Insanitary conditions led to frequent epidemics of the plague, in which many persons died. Fear of these epidemics was always present, and Shakespeare took for granted a knowledge of the terror which the plague inspired, as is shown in the second scene of Act V of *Romeo and Juliet*.

Crowded conditions in part caused these epidemics, but they gave London an air of bustling activity. Shops generally opened right onto the street, and apprentices shouted their masters' goods to every passerby. Since houses were crowded and the inner rooms tended to be dark and musty, most persons spent more time in the streets than city dwellers do today. The many street meetings and conversations in Shakespeare's plays reflect this tendency of the London populace to spend its leisuretime in the market places and out of doors.

**Influence of the New World.** In Shakespeare's London, the average man was curiously divided in his outlook between the medieval and the modern. The amaz-

**Farming during Shakespeare's Time** was done with crude tools. This wheat planter is sowing grain in the furrows made by the ox-drawn plow. His grain bag is hanging on the tree. The long stick was used to frighten birds.

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## SHAKESPEARE, WILLIAM

ing new world of the Americas was very much with him as he listened to the tales told by seamen who had sailed with Frobisher or Hudson, or had raided Spanish ships returning from Mexico and Peru with silver and gold. The famous *Golden Hind*, the very ship in which Drake had sailed around the world, was tied up at Deptford for all Londoners to see. It proved a solid witness to the extraordinary new fact that the world was really round. This background of sailors' stories of wonderful faraway lands is particularly apparent in Shakespeare's *Tempest*. Many details of the wreck and of Prospero's island came from stories about the *Sea Adventurer*, an English ship which had been wrecked in Bermuda on her way to Virginia in 1609. The same interest in seas and ships is evident in *The Merchant of Venice* and *Twelfth Night*.

**Superstitions.** The Elizabethan Englishman, for all his interest in the New World, new discoveries, and strange facts, still kept many superstitious beliefs which seem odd today. Belief in ghosts, witches, and magicians was common, and Shakespeare used them in such plays as *Julius Caesar*, *Macbeth*, *The Tempest*, *Hamlet*, and *Richard III*. Equally common were beliefs in portents — dreams, supernatural sights, and sounds, which warn men of future catastrophes. Elizabethans accepted such warnings as probable enough when Shakespeare

**The Elizabethan Farmer** used a two-wheeled wooden plow drawn by a yoke of oxen. After he plowed, the farmer broke up the earth with a crude harrow, like the one standing at the edge of the field. Farmers wore a distinctive costume.

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**The Upper Classes of Shakespeare's Time** were noted for their lavish dress and elegant manners. This picture from "*The Booke of Falconrie*" shows that even the horses had beautiful trappings. The nobles hunted with trained falcons.

used them, although they seem strange to us today.

**The Audience.** Audiences of Shakespeare's days were both more primitive and more cultivated than they are today. That they were more primitive is shown by their liking for cruelty and bloodshed. One of the most popular sports of the time was bullbaiting, in which the spectators watched a tied bull fight bulldogs. Loud was the applause when a bull tossed a dog so high in the air that he was killed by his fall, or when a dog got a firm grip on the bull's lip and held on until his jaws had to be pried apart. Equally popular was bearbaiting, in which dogs fought with a bear, or men stood about and whipped a chained blind bear while he tried to get at them. The same persons who attended these sports at the Bear Garden near Shakespeare's Globe Theater also flocked to the public executions of traitors at Tyburn. People accustomed to such sights were not shocked when Gloucester's eyes were put out in *King Lear* or Titus's hand was cut off in *Titus Andronicus*.

**Music.** But these same Elizabethans with their thirst for cruelty had a taste for music and poetry that has seldom been equaled. Their enthusiasm for poetry is shown in the amount of verse published and in the number of plays, most of them written in verse, performed during Shakespeare's lifetime. There are many examples of the popular delight in music. Elizabethan barbershops entertained waiting customers, not as

modern shops do with newspapers and magazines, but with lutes (guitarlike instruments) on which the customers might play accompaniments for themselves and their friends. The common entertainment in ordinary homes was not cards or books but music. After dinner, songbooks were passed around, and each person was supposed to be able to read his part at sight and join in the singing. A man who could not sing or read music was thought poorly educated. Since music was so popular and so widely understood, it is little wonder that most Elizabethan plays have music in them. Shakespeare used fifty or more songs in his plays and wrote hundreds of stage directions calling for music. Only one of his thirty-seven plays is, like most modern plays, entirely without music.

This almost constant use of music shows not only that there was a constant demand for what Shakespeare called the "concord of sweet sounds," but also that the playwrights could count on the presence of singers and musicians among the actors who performed their plays. All London theaters had orchestras, some of them very good indeed. At one time the orchestra at Shakespeare's Blackfriars Theater was said to be the best in London.

**Innyard Theaters.** The peculiar structure of the theater in which his plays were first acted also influenced Shakespeare's playwriting. Modern readers with little knowledge of the theater often overlook this influence. All good dramatists, from the Greeks to the moderns, have planned their plays to make the most of the peculiarities of the buildings in which their plays would be performed. Consequently, the changing characteristics of theater buildings have always had a great influence on plays.

The first theater in England was built when Shakespeare was twelve years old. For many years before that, the troupes of actors had presented their plays in innyards. Such places were very convenient and amazingly well-adapted for the purpose, because of the peculiar structure of the Elizabethan inns. These two- or three-

**The Newe Fishe Streete Market in Shakespeare's London** was a bustling trading center. When business began in the morning, shutters were opened outward and used as display

Then careful man hath care,  
And leas how god hath pray;  
He kills his wyne And wilst to make good chaffe  
To sage the tyme while winters rage doth cease.

December  
Capricornus

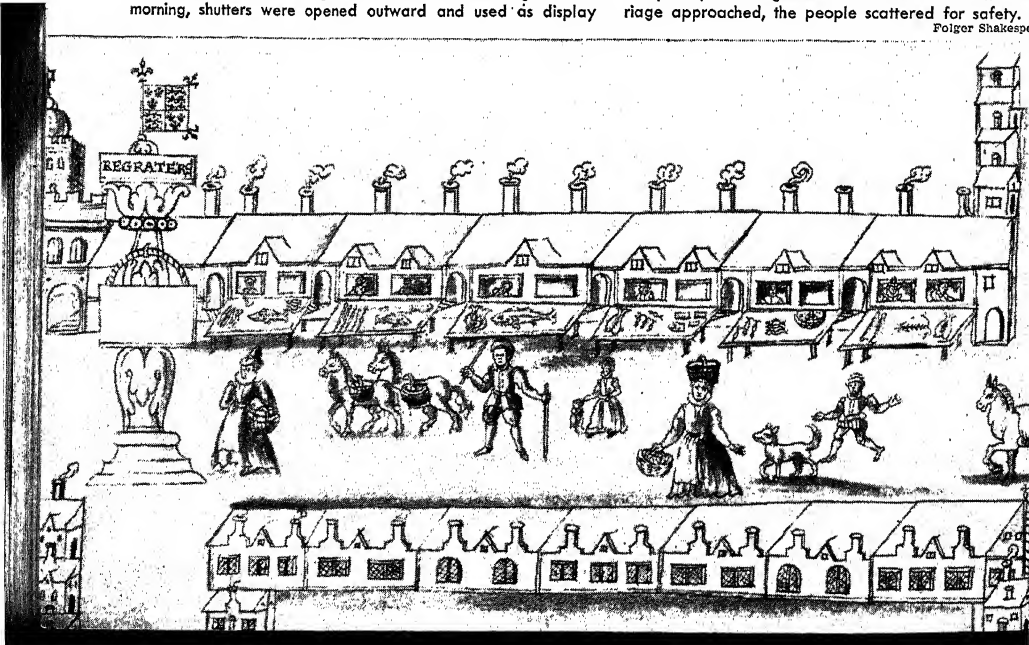


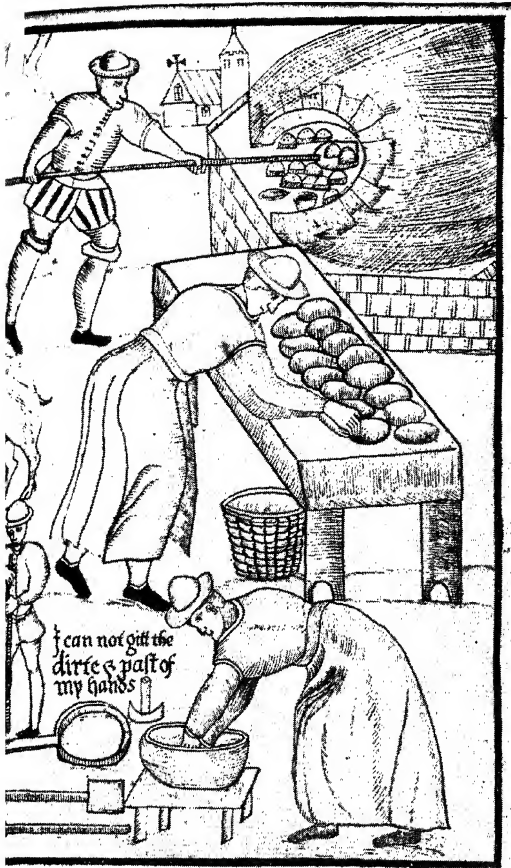
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**A Winter Butchering Scene in Elizabethan England.** The hog in the kettle has been killed and is being scalded so that its bristles can be scraped off easily. The butcher's tools are a crude knife, cleaver, tongs, bellows, and ax.

stands for various kinds of fish. Sidewalks were unknown and everyone jostled together in the uneven streets. When a carriage approached, the people scattered for safety.

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**The Baker of Shakespeare's Time** used large brick or clay ovens. First he built a wood fire which he allowed to burn until the oven was red hot. Then he raked out the wood embers and ashes, and pushed in the bread dough with a paddle.

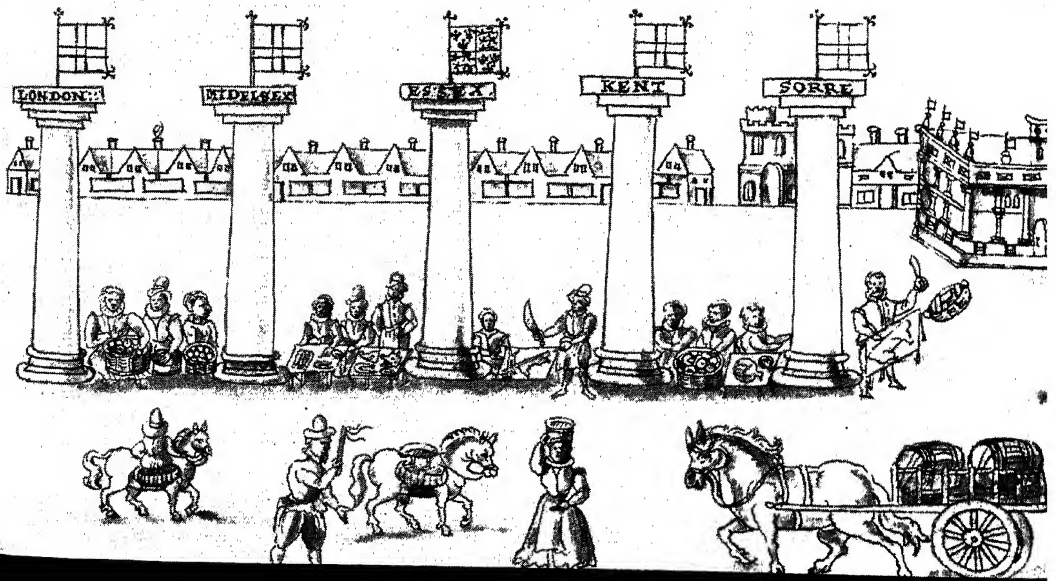
**The Grace Church Market in Elizabethan London** was another of the city's crowded business districts. Despite its high-sounding religious name, the market had much cheating and

story buildings were built in the form of a hollow square around a paved courtyard where travelers dismounted and wagons were unloaded. Galleries or balconies ran around this courtyard at the second and third stories. These were normally used by the guests of the inn to get to their rooms. When the players came to town, they found it very easy to set up a platform stage at one end of the innyard. On the afternoon of the performance, one actor stood at the entrance to the courtyard to collect a general admission fee. Another actor at the foot of the stairs leading to the galleries collected a second fee for the reserved seats. The patrons who paid only the general admission fee stood in the courtyard around the platform stage. Those who bought reserved seats went up to the galleries and sat on the stools and benches provided there. All the action of the play took place on the open platform, with no curtain to cut off the view of the stage at any time. The actors had to walk on and off in full view of the audience, and if any character in the play died on the stage, he had to be carried off. This open platform surrounded by the audience is the fundamental feature of the Elizabethan stage, both in the innyard and in the later theaters. Its influence is to be seen in nearly all the plays of the time.

**First London Playhouse.** Finally the drama became so popular in London that a permanent theater promised to be a good investment. James Burbage, father of the Richard Burbage who became the greatest actor of the time and the creator of many of the chief roles in Shakespeare's plays, built the first London playhouse and named it "The Theater." It was located in the suburbs north of the city. There it was beyond the authority of the Lord Mayor and the Council, who were always unfriendly to plays and players and interfered with them whenever they could. All the London public theaters built in Shakespeare's lifetime—the Curtain, the Globe, the Fortune, the Red Bull, the Swan, the Rose—were also located in the suburbs, either north or south of the city. All these public theaters were similar to Bur-

fraud. The popular rule of the market was "let the buyer beware." After dark, the people carried burning faggots. The women sometimes carried bundles on their heads.

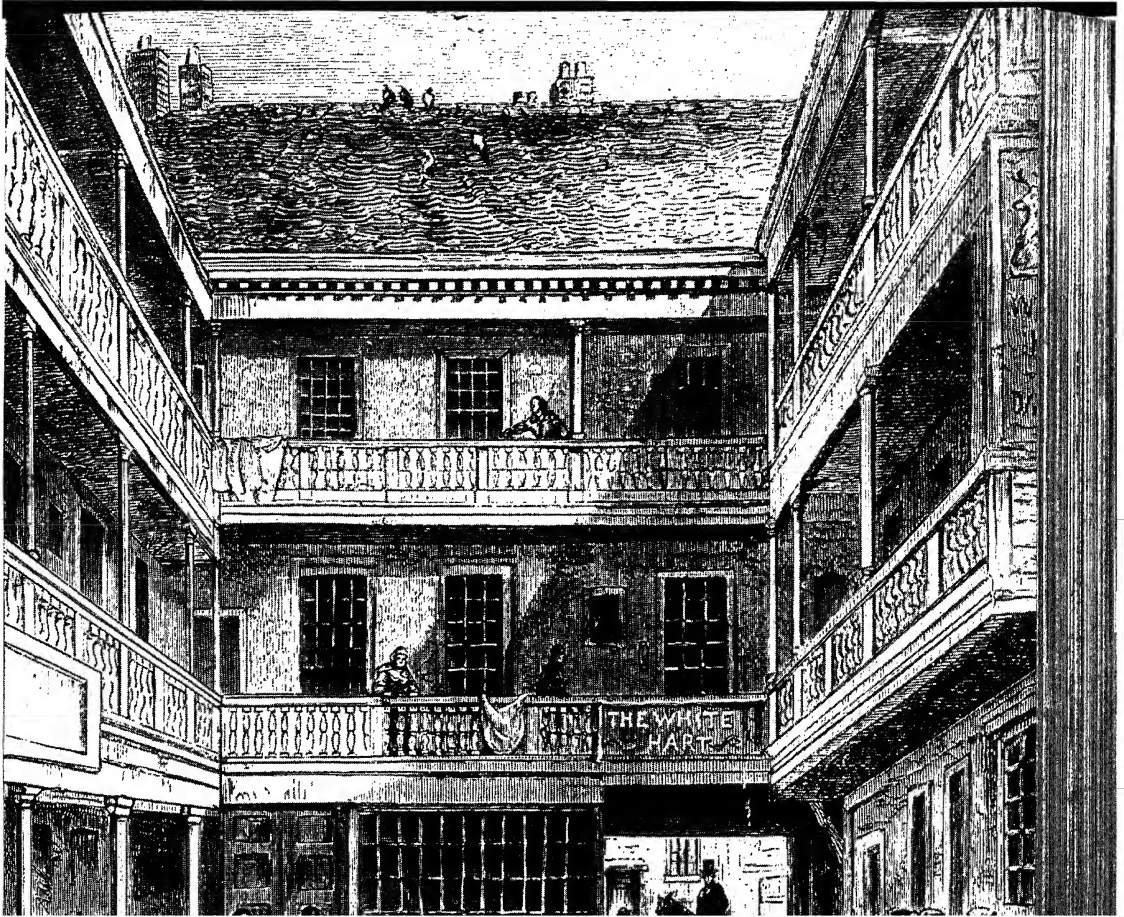
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## LINES ASSOCIATED WITH FAMOUS SHAKESPEAREAN CHARACTERS

LINES	CHARACTER	SOURCE
Lord, what fools these mortals be!	Puck	<i>A Midsummer Night's Dream</i> Act III, Sc. 2, 115
Benedick, the married man	Benedick (spoken by Don Pedro)	<i>Much Ado about Nothing</i> Act V, Sc. 4, 99
O that I had been writ down an ass!	Dogberry	<i>Much Ado about Nothing</i> Act IV, Sc. 2, 72
Just as high as my heart	Rosalind (spoken by Orlando)	<i>As You Like It</i> Act III, Sc. 2, 270
An ill-favour'd thing, sir, but mine own	Touchstone	<i>As You Like It</i> Act V, Sc. 4, 58
Neither a borrower nor a lender be	Polonius	<i>Hamlet</i> Act I, Sc. 3, 75
To be, or not to be — that is the question	Hamlet	<i>Hamlet</i> Act III, Sc. 1, 56
Frailty, thy name is woman!	Gertrude (spoken by Hamlet)	<i>Hamlet</i> Act I, Sc. 2, 146
This was the noblest Roman of them all	Brutus (spoken by Antony)	<i>Julius Caesar</i> Act V, Sc. 5, 68
He doth bestride the narrow world like a Colossus	Julius Caesar (spoken by Cassius)	<i>Julius Caesar</i> Act I, Sc. 2, 135
One that lov'd not wisely, but too well	Othello	<i>Othello</i> Act V, Sc. 2, 346
Her voice was ever soft, Gentle, and low — an excellent thing in woman	Cordelia (spoken by Lear)	<i>King Lear</i> Act V, Sc. 3, 272-273
A snapper-up of unconsidered trifles	Autolycus	<i>The Winter's Tale</i> Act IV, Sc. 3, 26
Age cannot wither her nor custom stale Her infinite variety	Cleopatra (spoken by Enobarbus)	<i>Antony and Cleopatra</i> Act II, Sc. 2, 240
A horse! a horse! my kingdom for a horse!	King Richard III	<i>King Richard III</i> Act V, Sc. 4, 7
A pair of star-crossed lovers	Romeo and Juliet (spoken by the chorus)	<i>Romeo and Juliet</i> Prologue, 6
For God's sake let us sit upon the ground And tell sad stories of the death of kings!	King Richard II	<i>King Richard II</i> Act III, Sc. 2, 155-156
Screw your courage to the sticking place	Lady Macbeth	<i>Macbeth</i> Act I, Sc. 7, 60
I am not only witty in myself, but the cause that wit is in other men	Falstaff	<i>King Henry IV, Part II</i> Act I, Sc. 2, 11
Had I but serv'd my God with half the zeal I serv'd my king, he would not in mine age Have left me naked to mine enemies	Wolsey	<i>King Henry VIII</i> Act III, Sc. 2, 455-457
A pound of flesh	Shylock	<i>The Merchant of Venice</i> Act III, Sc. 3, 33





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**The Innyard Was the Forerunner of the Playhouse.** In such courtyards as this, the early plays of Shakespeare were presented. A stage was set up at one end for the actors. Per-

sons who paid for reserved seats sat on stools and benches on the balconies of the building. Those who paid general admission stood in the courtyard to watch the play.

bage's in design with only a few minor variations.

Naturally enough James Burbage and the theater builders who followed him patterned their theaters after an innyard, with a few additional conveniences added for the patrons and the actors. Even in the theaters the spectators who paid general admission stood on the bare ground about the stage with only the sky for a roof, just as they had done at the innyard performances. These poorer spectators, who could not pay for seats in the galleries, were called "groundlings" by Shakespeare in some rather insulting remarks he made about them in *Hamlet*. By paying a few pennies extra to go up in the galleries, the well-to-do spectators had somewhat better accommodations than had been available at the inns, for the theater galleries were deeper and had fairly comfortable benches.

Naturally enough, most of Burbage's improvements were designed for the convenience of the actors. Behind the stage there were dressing rooms. Above it was a high canopy, or canvas top, for lowering gods and witches through the air. There were trapdoors in the floor, and three different entrances to the stage. More important still, there were two new parts to the stage. Behind the large platform on which most of the action took place was an alcove, a room shut off from the audience by a curtain which could easily be pulled aside. In this room, called the inner stage, actors could be suddenly revealed or hidden by the curtain, as they are in modern theaters. It was on this part of the stage that the death of Desdemona took place in *Othello*, the Capulets' tomb in *Romeo and Juliet* was placed, and Ferdinand and Miranda played chess in *The Tempest*. In short, the inner stage

was used for any scene requiring a curtain — any scene which could not be opened by a simple entrance or closed by an exit.

Directly above the inner stage a part of the balcony was partitioned off. This upper stage was used when the action required certain characters to stand above the others — on the walls of a city, on a balcony, or in an upper room of a house. Juliet stood on the upper stage while Romeo made love to her from the garden in the famous balcony scene of *Romeo and Juliet*. There, too, stood the governor of Harfleur when he surrendered the town to King Henry in Henry V, and Cleopatra and her maids occupied it when they drew up the dying Antony in *Antony and Cleopatra*.

These were the main characteristics of the public theaters in which Shakespeare rehearsed and acted, and for which he wrote his plays. There were private theaters in London at the time, but there is no evidence that Shakespeare ever wrote for them until his company took over the Blackfriars in 1608, when his career as a playwright was nearly over. Many of the Elizabethan plays were acted in both public and private theaters. The private theaters were different from the public ones in that they were smaller, completely enclosed, artificially lighted, and fitted with seats on the main floor as well as in the balcony. They charged much higher prices, and it was not possible for poorer people to attend them. The audiences in private theaters were, therefore, more select.

**Stage Properties.** Elizabethan plays moved much more rapidly than do modern ones. The numerous act and scene divisions in modern versions of Shakespeare's plays (most of which have been added by editors) suggest to us many curtains and intermissions, but these divisions were scarcely noticeable to the Elizabethan audience. One scene followed another without pause, since there was no curtain to fall and no scenery to be moved. In most scenes there was no reference to the place of action. The spectators simply concentrated on the actors and gave no thought to the place. Such a situation is difficult for modern readers to imagine, for in all modern plays each scene is definitely located and scenery is generally used.

But in spite of the lack of scenery, Shakespeare did not write his plays for a colorless production on a bare, drab platform. The back wall of the stage was hung with bright tapestry, or arras, behind which characters sometimes hid themselves, as did Polonius before Hamlet plunged his rapier through the arras to kill him. Properties of all kinds were regularly used — tables, benches, beds, chairs, and chests, and even trees, rocks, and walls on occasion.

**Costumes.** The most colorful part of an Elizabethan production was undoubtedly the costumes. These are seldom equaled on the modern stage, for even the most formal gowns and uniforms of today do not offer such a vivid variety of colors and materials as did the everyday dress of Elizabethan ladies and gentlemen. Not only was the costume of any young gentleman likely to display crimson and gray, purple and gold, but the styles were also varied so that no two gentlemen looked alike. Any well-dressed young man, as Orlando, Bassanio, or Romeo, differed as sharply in appearance from a servant,

clergyman, or physician as a modern bank president differs in appearance from a circus clown.

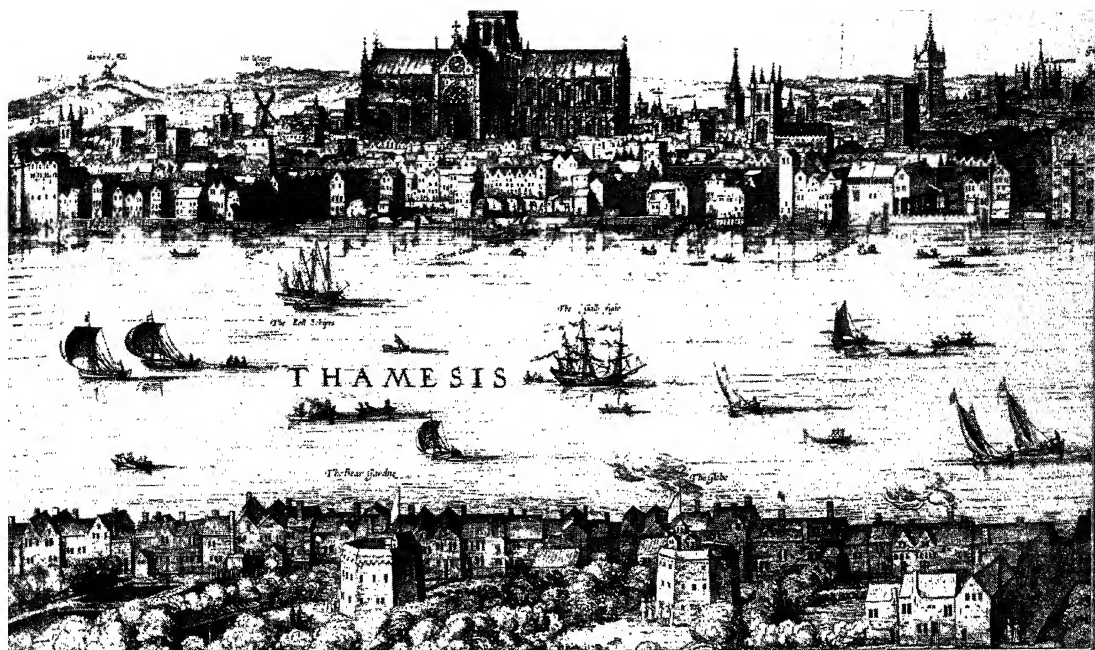
Elizabethan costume was thus of great value to the actors and dramatists of Shakespeare's day, who took the fullest possible advantage of it in giving color and variety to their plays. On several occasions one producer is known to have spent twice as much for the costume of one actor as he paid the dramatist for the play in which the costume was worn. In addition, the variety of costumes, haircuts, and beards offered certain possibilities, both in real life and in plays, which have practically disappeared from modern life. The chief of these was disguise, which is almost unknown in modern plays and is rare in modern life. The reason is that most men now shave and cut their hair in the same general style, and their clothes differ only in details. Today a man cannot change his appearance a great deal without making himself conspicuous. But when costumes, beards, and haircuts differed as they did in Shakespeare's day, it was fairly easy for a clever man to deceive even his close friends for a limited time, as did Kent in *King Lear*.

**Women's Parts.** The most common disguise in Shakespeare's plays, and the one most puzzling to modern readers and actors, is that of young ladies as boys. Here the Elizabethan actor and playwright had other advantages in addition to the variety in costume. There were no actresses on the London stage when Shakespeare wrote. All women's parts were taken by boys, as they had been in all English plays for hundreds of years. These boys, of course, were apprenticed to actors. For several years they lived with the players, heard stage talk all the time, attended hundreds of rehearsals, saw a play nearly every afternoon, took small parts in productions, and practiced female impersonation at every opportunity. It is little wonder that after several years of such life, with the help of a careful dramatist, a good make-up man, and an intelligent costumer, a bright, talented boy could present a convincing portrayal of Rosalind, Viola, or Portia. Yet nothing could be simpler than for him to stop pretending to be Rosalind and become Ganymede, drop Viola for Cesario, or change the dress he was wearing as Portia for the formal robes of Balthasar, the young lawyer.

In these ways Shakespeare was not only deeply influenced by the character of Elizabethan life, but he also employed brilliantly the structure of the Elizabethan stage. He constructed his plays to make effective use of the inner, outer, and upper stages. He took full advantage of the swift, continuous action of a curtainless front stage. He used to the fullest degree the variety and color of Elizabethan costume, and even made an asset out of the liability of having no women actors for female roles.

### Editions of Shakespeare

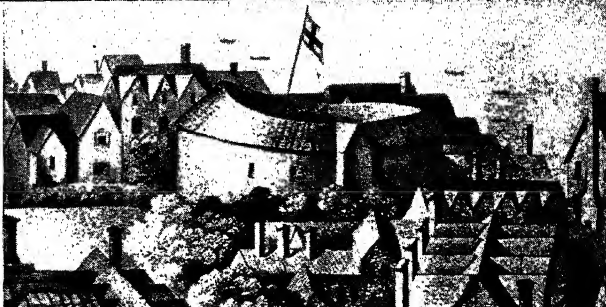
**First Quartos.** The fact that plays had a somewhat low literary reputation in Shakespeare's time is reflected in the early editions of his dramatic works. During his lifetime fewer than half of his plays were ever printed at all, and those that did appear were in the form of cheap pamphlets, now called quartos. Many of them did not even have the author's name on the title page. Shakespeare did not proofread any of these quartos, and all have numerous mistakes in the printing. Four of them



## STAGE AND THEATER

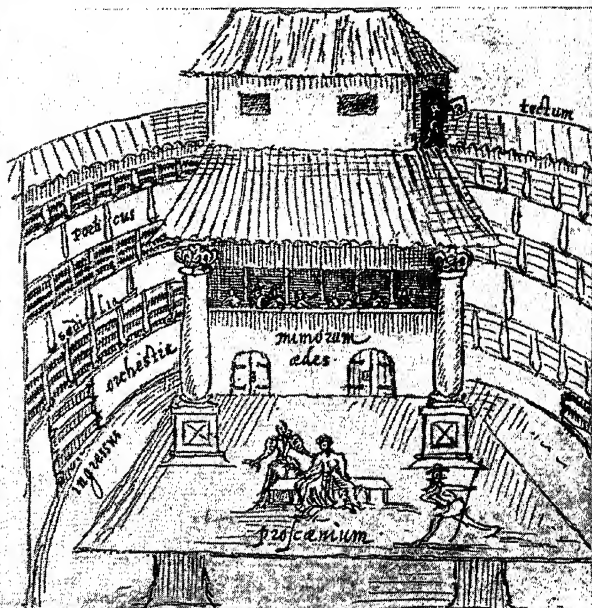
*Above:* A view of Shakespeare's London by Visscher, the famous engraver. In the foreground are the Bear Garden and the Globe Theater. *Right:* A close-up view of the Globe Theater with the flag flying to show that a performance is scheduled for that day. *Below:* The stage of the middle-seventeenth century. Notice the curtains at the rear and the balcony above it.

Photo: Folger Shakespeare Library



*Below:* An old sketch showing the stage and galleries of the famous Swan Theater, located not far from the Globe Theater.  
**Photo: Folger Shakespeare Library**

Photo: Folger Shakespeare Library



omit at least one fourth of the lines of the play as written by Shakespeare. Such careless printing characterized nearly all plays of the time, and Shakespeare was like all his fellow dramatists (with the single exception of Ben Jonson) in showing little or no concern about the publication of his plays. His whole attention was directed toward the stage.

**The First Folio.** Seven years after Shakespeare's death, when plays had risen somewhat in public esteem, two of his old friends and fellow actors, John Heminges and Henry Condell, collected his plays and had them printed in a large and handsome volume. It contains the famous Droeshout portrait of Shakespeare, a preface by the editors, a list of actors who had roles in Shakespeare's plays, a dedication to two noblemen, and several verses in honor of the playwright, as well as thirty-six of his plays. Such a book was most unusual in 1623, when this volume of collected works was brought out, for only one other collection of plays had ever been published in England.

This volume, which is now called the first folio, is the basis for Shakespeare's text. Even when it first appeared, it was somewhat expensive, and sold for one pound unbound. (This was ten to twenty times the price of the average book in 1623.) Today, only the wealthiest collectors can afford to buy this volume. They sometimes pay as much as \$75,000 for a single copy.

The first folio was elaborate, but it was poorly printed according to modern standards. It is a beautiful book full of mistakes, lines repeated or dropped out, impossible punctuation, and verse printed as prose and prose as verse. Ever since it appeared, editors have been trying to correct its mistakes. Many errors have been caught by comparing the folio passage with the same line in a quarto. Others have been found by applying present-day knowledge of Elizabethan handwriting and out-of-date Elizabethan words. Still others have been discovered by using common sense. But many of the errors still exist, for no one has ever been able to puzzle out a satisfactory correction of certain meaningless lines in the first folio.

**Later Editions.** Hundreds of editors and scholars have labored during the last three hundred years to make it easier for modern readers to understand and enjoy Shakespeare's plays. Obviously, the text of a modern edition of Shakespeare is very different from that origi-

nally put forth in the 1600's. A few of the mistakes in the first folio were corrected by the anonymous editors of the second folio in 1632, of the third folio (1663-1664), and of the fourth in 1685, but these men made more new mistakes than they corrected old ones. The first editor to make any very great effort to help the reader was the playwright Nicholas Rowe, who edited Shakespeare's plays in six volumes in 1709. He wrote the first life of the dramatist. He made lists of characters for the twenty-eight plays which had never had them before. He divided the plays into acts and scenes, a task which had been only partly done in the folios. He also added many

stage directions to the small number in the earlier folios. In 1733, Lewis Theobald edited Shakespeare's works in seven volumes, and made more good corrections of bad lines than any other man has ever done.

Hundreds of editions of Shakespeare have followed in the last two hundred years. All the best ones make use of the corrections and explanations of the earlier ones and add new ones. Most famous are the editions of Samuel Johnson in 1765; the twenty-one-volume edition of Edmund Malone and James Boswell in 1821; and W. Aldis Wright's Cambridge edition (1863-1866). The most elaborate edition of Shakespeare is the *New Variorum* edition which was begun by Howard Furness in 1871. The vast collection of notes and comments in the bulky volumes of this edition are a monument to an un-

paralleled piece of Shakespearean scholarship. They are probably the greatest aid available today to students of Shakespeare.

**Popular Editions.** All these famous editions are useful to scholars, but for most people they are more confusing than helpful. The editions with notes explaining unusual words and puzzling situations are usually of greater help to modern readers. There are many such editions in a variety of forms. The smallest are the complete editions in one volume, such as *The Complete Works of William Shakespeare* in the *Students' Cambridge Edition* of William Allan Neilson (1906), or the more recent *Complete Works of William Shakespeare* edited by George Lyman Kittredge (1936). Both these volumes have introductions and word lists, but no notes, because there is no room for them. *The Arden Shakespeare* and *The Tudor Shakespeare* are good examples of the more expensive editions,



Bettmann Archive

John Drew as Petruchio in *The Taming of the Shrew*



issued one play to a volume with fairly extensive notes. For readers who need notes but cannot afford large sets of books, a convenient compromise is to be found in *Twenty-three Plays and the Sonnets*, by Thomas Marc Parrott, a one-volume edition with notes published in 1938. This book contains twenty-three of the more familiar plays, together with a discussion of Shakespeare's life and background. Convenient and inexpensive editions of four or five plays, bound in one volume with notes and introduction, are to be had in Holzknicht and McClure's *Selected Plays of Shakespeare*, and in the Arden edition of *Five Comedies of Shakespeare*, *Five Tragedies of Shakespeare*, and *Five Histories of Shakespeare*.

### Shakespeare through the Ages

Shakespeare was the child of his own times, but no man has ever succeeded more completely in passing on his art to other nations and other ages. His own friend, the dramatist Ben Jonson, was one of the first to realize this. Seven years after Shakespeare's death, he wrote, "He was not of an age, but for all time."

The tributes which have been paid to Shakespeare as a playwright would probably have given him the greatest pleasure. Scarcely a year has passed since he began to write which has been without a production of one or more of his plays. Shakespeare has been in the repertory of the greatest actors so constantly that the history of the English and American stage could almost be written in terms of Shakespearean performances.

### Famous Shakespearean

**Actors.** Since Richard Burbage performed Hamlet, Othello, Lear, and Richard III during Shakespeare's lifetime, nearly all famous actors have chosen to act in his plays. After the death of Shakespeare and Burbage, Joseph Taylor and John Lowin continued to act in the plays for the King's Company. After the Restoration in 1660, the greatest English actor of the time, Thomas Betterton, played Hamlet, Brutus, and Othello. His wife, Mary Saunderson, was one of the first women to act in a Shakespearean play.

In the next generation, the actor-manager Colley Cibber played Iago, Jacques, and Richard III. Samuel Johnson's generation admired one of the most famous of all actors, David Garrick, as Hamlet, Richard III, and Lear. Also popular at that time were Charles Macklin's Shylock, James Quin's Falstaff, and Peg Woffington's Rosalind. In William Wordsworth's and

Samuel Coleridge's day, John Philip Kemble played in twenty-seven different Shakespearean roles. Sarah Siddons, who was probably the most noted of all Shakespearean actresses, was famous as Lady Macbeth, Desdemona, Ophelia, and as Queen Catherine in *Henry VIII*. Even before she appeared in her greatest role, Lady Macbeth, Samuel Johnson was so impressed that he wrote his name on the hem of her dress in Sir Joshua Reynolds' famous portrait of her as the "Tragic Muse." Johnson said, "I would not lose the honor this opportunity afforded to me for my name going down to posterity on the hem of your garment."

In the middle 1800's, crowds flocked to see Edmund

Kean as Shylock, Hamlet, Othello, Macbeth, and Lear; William Charles Macready as Richard III, Lear, and Henry V; and Helen Faucit as Juliet, Desdemona, and Lady Macbeth. The favorites of the Victorians were Sir Henry Irving and Ellen Terry. Sir Henry dominated the stage of his time almost as completely as Garrick had a hundred years before. His *Merchant of Venice* ran for two hundred and fifty consecutive performances. In North America, Edwin Booth was the greatest Shakespearean actor of the time.

In the first quarter of the 1900's some of the best-known Shakespearean actors were Sir Herbert Beerbohm Tree, Robert Mantell, Edward Hugh Sothorn and Julia Marlowe (his wife), Sir Robert Benson, Sir Johnston Forbes-Robertson, and Mary Anderson.

Famous performers of Shakespeare are still drawing crowds. In recent years

John Gielgud, John Barrymore, Walter Hampden, Ethel Barrymore, Maurice Evans, Leslie Howard, Katherine Cornell, Charles Laughton, Laurence Olivier, Alfred Lunt and Lynn Fontanne (his wife), Jane Cowl, and Helen Hayes have performed Shakespeare with great success. Motion-picture versions of *Romeo and Juliet*, *Henry V*, and *Midsummer Night's Dream* were successfully produced, as were many radio versions of Shakespeare's plays.

The performances in theaters devoted wholly or chiefly to the production of Shakespearean plays are more like the repertory system of play production in Elizabethan times. The most famous of such theaters are the Old Vic in London and the Shakespeare Memorial Theater in Stratford-on-Avon. The Stratford Theater is one of the finest in the world. It has a permanent repertory company of actors.



Maurice Evans as Falstaff in *King Henry IV*





Folger Shakespeare Library

David Garrick and Mrs. Pritchard in *Macbeth*

### Memorials

Memorials to Shakespeare of one kind or another are scattered throughout the world. They include theaters, statues, pictures, and books. Even streets, towns, and commercial products are named for him and his characters. One of the greatest of the memorials, and one of which Americans can be especially proud, is the Folger Shakespeare Library in Washington, D.C. This is the greatest collection that has ever been made of books, manuscripts, and pictures relating to Shakespeare and his time. Scholars from all parts of the world come to the Folger Library to study the material gathered there. In the years to come, probably no other memorial to Shakespeare will have so great an influence on the knowledge and understanding of the man and his plays. Other notable libraries with important Shakespeare collections include the Bodleian Library at Oxford, England; the British Museum; the Horace Howard Furness Memorial at the University of Pennsylvania; and the Henry E. Huntington Library located at San Marino, Calif. G.E.B.

### Synopses of the Plays

**As You Like It.** The scenes of this delightful comedy are laid chiefly in the Forest of Arden, where shepherds lead an easy life and everything is "as you like it." To the forest come an exiled French duke and his followers, leaving at court his daughter Rosalind; his younger brother, Duke Frederick, who has taken his place; and Frederick's daughter Celia, who pleads so eloquently for her cousin's companionship that Frederick allows Rosalind to remain. In a court match, the duke's professional wrestler is overcome by a youth named Orlando, who proves to be the son of an old friend of Rosalind's father. Rosalind and Orlando fall in love, but are soon separated. Rosalind is banished by Frederick. With Celia, who refuses to desert her, and Touchstone, the court jester, she takes refuge in Arden. There the girls buy a farm and live as brother and sister. Celia poses as a shepherdess and the taller Rosalind wears man's clothing and calls herself Ganymede, a young shepherd.

Meanwhile, Orlando flees to Arden with his old servant Adam, to escape the plotting of his murderous brother Oliver, and finds a refuge with the banished duke. His love verses to Rosalind, which he carves on the bark of trees, are read by the disguised Rosalind. When they meet, she tests him by offering to impersonate Rosalind so that he may be cured of his love by meetings and conversations with her. Reluctantly Orlando consents, to Rosalind's delight. Now and then the melancholy Jacques

contributes a bit of sour philosophy. One day Orlando kills and is wounded by a lion that is attacking his brother Oliver, who has come to the forest in search of him. The penitent Oliver, sent to Ganymede with a note explaining why Orlando is delayed in keeping a tryst, sees Celia and falls in love with her. The play ends happily with a wedding of the four couples. Rosalind resumes her feminine dress and is wed to Orlando. Touchstone is married to the country maid Audrey. Oliver is wed to Celia. The shepherd folk, Phebe and Silvius, complete the party. In the midst of this rejoicing, word comes that Duke Frederick has restored the dukedom to Rosalind's father, and at the end all is well.

**Hamlet,** perhaps the most famous of Shakespeare's plays, is a drama of revenge. Hamlet, a young prince of Denmark, is grieved and mystified by the sudden death of his father; by his beloved mother's hasty marriage with the dead king's evil, plotting brother, Claudius, who has taken the throne; and by the stupidity and (as he thinks) faithlessness of his sweetheart Ophelia, the daughter of Polonius. His friend Horatio warns him that a ghost resembling his father is appearing nightly before the castle, and Hamlet watches for the specter. In a thrilling night scene he is told the story of his father's murder by Claudius. Hamlet's actions have been variously interpreted. Most critics believe he only pretends madness to lull suspicions and to get opportunities for revenge. His course is especially distressing to Ophelia. Shocked and overwhelmed by the evil in his world, Hamlet must await the right moment to act, and broods over the pain of life. He even thinks of suicide. A band of strolling players arrive, and Hamlet traps the king by having the actors speak certain lines about a king's being murdered by his brother. Claudius pretends illness and leaves the hall, thus proving his guilt. Later, in his mother's room, Hamlet scolds her for her conduct. During this interview he thrusts his dagger through a curtain behind which he thinks the king is hiding, but kills old Polonius who is eavesdropping.

The alarmed Claudius sends Hamlet to England under escort of Rosencrantz and Guildenstern. He finds they carry written orders to have him killed, and secretly substitutes their names for his. He escapes and returns to Denmark. He reaches there in time to witness the burial of Ophelia, who has lost her reason and been drowned. At the grave, a meeting between Hamlet and Ophelia's brother Laertes, who plots with Claudius to kill the prince, is followed by a fencing duel between the young men. Laertes uses a poisoned foil with which he wounds Hamlet. The young prince turns this weapon on Laertes, and before he himself dies, succeeds also in stabbing his treacherous uncle. The guilty mother receives her just punishment by accidentally drinking the poisoned cup prepared for Hamlet.

**Henry IV, Parts I and II.** The two parts of this historic play form a dramatic whole, and give a vivid picture of England in the early 1400's. The chief characters are King Henry IV, who is conscience-stricken for having taken the throne dishonestly from Richard II; his two sons, the merry Prince Hal and Prince John; Hotspur (Henry Percy), son of the Earl of Northumberland; and Sir John Falstaff, a low-living, fat, and jolly old warrior whose escapades provide most of the humor of the play. Falstaff is Prince Hal's favorite companion. King Henry longs to go on a crusade to make up for his sins, but is delayed by rebellion in Scotland and Wales. He quarrels with Hotspur over the delivery of prisoners taken on the field of Holmedon, and the Percys revolt against him. On the field of Shrewsbury, Hotspur is slain by Prince Hal. In the concluding scenes of Part I, Falstaff pretends death to avoid being killed.

In Part II there is a continuation of the clowning of the Falstaffians, mixed with the story of the tired old king, approaching his end and worried over the Percy

rebellion. News comes of the end of the disorder through the hand of Prince John, who has offered the rebels peace with honor, and then had the scattering troops killed and the leaders executed. The death of King Henry follows, and Prince Hal is crowned Henry V. He shows himself a real king, and forbids the Falstaffians to come within ten miles of him until they reform. See *HENRY (IV, England)*.

**Henry V.** This play gives an idealized picture of a brave and gallant monarch, Henry V. He gives up the care-free friends of youth, and begins a career of foreign conquest by demanding the throne of France from the French dauphin. The dauphin responds with the gift of a box of tennis balls, and England prepares for war. In France, the English troops, stirred by their king's eloquent appeal, force the surrender of Harfleur and camp before Agincourt. That night, Henry disguises himself in a long cloak and mingles with his soldiers. In an argument with a private, he accepts the private's glove and challenge for the next day. Though heavily outnumbered, the English win the battle.

Humorous episodes are introduced now and then, including a scene between Henry and the private, who has sworn to box the ears of the man who has his glove. Falstaff, meanwhile, has died, broken-hearted, because the king has cast him off. After the Battle of Agincourt, Henry is graciously received at the French court, and is not only promised the throne of France, but also the hand of the Princess Katharine, with whom he has fallen in love. See *HENRY (V, England)*.

**Julius Caesar.** The stirring period of the declining Roman republic and a great historic character furnish the background for this magnificent drama. But in spite of its name, the play is the tragedy of Brutus, Caesar's best friend, about whom the drama is built and who has five times as many lines as Caesar. It begins on a high note—victorious Caesar is escorted to the Capitol by enthusiastic admirers and three times refuses the crown offered by the eloquent Mark Antony. But already storm clouds are gathering. Patriotic, highly respected Brutus, the "lean and hungry Cassius," and blunt-speaking Casca are plotting Caesar's downfall, for they fear that he is becoming a dictator and that his kindly rule will put an end to the republic and Roman liberty. Caesar is warned by a fortune-teller to "beware the Ides of March," but on that day he goes to the senate house with a group of conspirators, who all pretend to be friendly, and is there stabbed to death. He resists until he sees Brutus' dagger. Then he draws his cloak about him, and falls with "Et tu, Brute" (Thou, too, Brutus) on his lips.

Brutus persuades the fickle mob that the murder was necessary to save the republic, but unwisely permits Antony to deliver a funeral oration over Caesar's body. The clever Antony turns the people against the plotters, who are forced to flee. Antony, Caesar's grand-nephew Octavius, and Lepidus, form a triumvirate and lead an army against them. On the plains of Philippi, the night before the battle, Brutus is startled by the ghost of Caesar and forsores his own doom. The battle is lost, Cassius orders his servant to kill him, and Brutus falls on his sword, realizing that he had killed a man he both honored and loved and that Antony and Octavius will be worse masters for Rome than Caesar ever could have been. (All the important characters in this play are described in *THE WORLD BOOK ENCYCLOPEDIA* under their own titles.)

**King Lear.** The tragic story of King Lear gives a dramatic presentation of the relationships between parents and children. Lear, king of Britain, prepares to divide his kingdom among his three daughters: Goneril, wife of the Duke of Albany; Regan, wife of the Duke of Cornwall; and Cordelia, youngest and best beloved. The father childishly asks for an expression of their daughterly affection, and is so deceived by the older girls' flowery endearments, and so angered at Cordelia's modest,

though sincere, statement, that he disinherits her and arranges to live with the other two in turn. The good Earl of Kent is banished for his interference in Cordelia's behalf, but the girl finds a haven in the love of the king of France, who marries her.

Kent returns in disguise to look after the king and finds Goneril ordering him to reduce his train of followers by half. Angry and hurt by Goneril's ingratitude, Lear meets Regan at the castle of the Earl of Gloucester. She harshly repulses him, and in despair he staggers out into a night storm. With Kent and the faithful court fool, the old king, who is now insane, finds refuge in a hut. He there meets Gloucester's son Edgar, who, disguised as a beggar, is fleeing from the plots of his wicked half-brother Edmund. Gloucester arrives with offers of shelter, and has the old man taken to Dover, where Cordelia has landed an army prepared to restore her father's rights.

In camp the broken old man is tenderly cared for by Cordelia, and thinks himself in Heaven. Meanwhile, Gloucester's eyes are put out by Cornwall, and he is cared for by Edgar. In a battle between the English (commanded by Edmund) and the French, the French are defeated, and Cordelia and Lear are taken prisoners. Edgar discloses his identity to his dying father, and kills Edmund in a trial by combat. But he is too late to save Cordelia, whom Edmund has ordered hanged. Lear dies. Goneril, jealous of her sister's love for Edmund, poisons Regan, and then stabs herself. The tragedy is somewhat relieved throughout by the jests of the court fool, whose loyal affection for his master shines through his apparent foolery.

**Macbeth.** This is one of the greatest dramas of all time. *Macbeth* is the story of one who suffered disaster through too much ambition. The scenes are laid in Scotland. On his return from a successful campaign in the North, Macbeth, accompanied by Banquo, meets three witches who hail him as Thane of Glamis, Thane of Cawdor, and King of Scotland, respectively, and prophesy that sons of Banquo will occupy the throne. The first seeds of ambitious design are planted at this time. Macbeth is already Thane of Glamis, and is soon appointed Thane of Cawdor by King Duncan. With the vision of the kingship before him, and urged on by his wife, Macbeth murders the king while he is a guest in Macbeth's home. The two sons of Duncan flee in terror from the castle, and draw suspicion to themselves. Macbeth is crowned king, but is uneasy concerning the witches' prophecy about Banquo and his sons. Accordingly, he hires assassins to murder Banquo and his son Fleance. At a state banquet, the king is told that Banquo has been slain, but that the son has escaped. Here, Macbeth sees Banquo's ghost and talks so wildly that the feast breaks up in disorder.

He has another interview with the witches, who tell him he must "beware Macduff," but assure him that "none of women born" can harm him, and that he need not fear until Birnam wood shall come to Dunsinane Castle. Sinking ever deeper into crime, Macbeth orders Macduff's wife and children slain when he learns of Macduff's flight to England. These crimes so affect the queen that she becomes a sleepwalker and finally dies. Macduff raises a large army and advances toward the castle, with his troops screened by branches from the trees of Birnam. Macbeth is horrified at seeing Birnam wood really coming to Dunsinane, but relies on the rest of the prophecy. He meets Macduff, and warns him that he will never yield to one of woman born. Macduff replies that he was "from his mother's womb untimely ripped." In the battle that follows, Macbeth is slain and beheaded. Malcolm, son of Duncan, is then proclaimed king of Scotland.

**Merchant of Venice.** This, one of Shakespeare's most popular plays, is a vivid study of greed and hatred. Shylock, the Jewish money-lender, hates the merchant Antonio, generous friend of Bassanio, because of per-

sonal insults, and because Antonio refuses to ask for interest on loans. Bassanio wishes to borrow 3,000 ducats from Antonio, so that he may go to Belmont to ask Portia to marry him. Antonio borrows the money from Shylock, and, remembering that he will soon have several ships in port, agrees to part with a pound of flesh if the money is not repaid in three months. Shylock's hatred of Antonio is increased by the elopement of his daughter Jessica, who runs away with the Christian Lorenzo, another friend of Antonio's, carrying with her much money and many jewels. At Belmont, the beautiful and wealthy Portia is wooed by Bassanio, and both rejoice when he chooses the right one out of three caskets—gold, silver, and lead. According to her father's will, she is to marry the suitor who chooses the lead casket, which contains her picture. Their joy is interrupted by a letter from Antonio telling of the loss of his ships, and of Shylock's determination to carry out the terms of the bond. Bassanio marries Portia, and his friend Gratiano marries Nerissa, her maid. They all return to Venice, but cannot help Antonio in court.

When all seems lost, Portia, disguised as a lawyer, enters with her clerk (Nerissa, her maid), and argues the case. She reminds Shylock that he can have only the flesh the agreement calls for, and that if a single drop of blood is shed, his property will be confiscated. He is then willing to accept money in lieu of flesh, but the court decrees a punishment for his conspiracy against the life of a citizen, and he is forced to turn Christian and give half his property to Jessica, whom he had renounced. The play ends on a brighter note, with Bassanio and Gratiano being teased by their wives for having given their betrothal rings to the learned "doctor" and his "clerk."

**Midsummer Night's Dream.** In this fairy play, Theseus, the Duke of Athens, is preparing to marry the lovely Hippolyta, queen of the Amazons. Egeus, a citizen of Athens, comes complaining that his daughter Hermia refuses to marry Demetrius. Hermia is kindly told by the duke that the law orders her to obey her father, so she flees with her lover Lysander to the enchanted wood of the fairies, ruled over by Oberon and Titania. They wander here in company with Hermia's friend Helena, and Demetrius, whose love Helena has lost. King Oberon has quarreled with Titania, and has ordered Puck, his attendant, to get a magic love juice which, when applied to her eyelids, will cause her to love the first person she views on awakening. Oberon sees the unhappy Helena, and in pity he tells Puck to touch the eyelids of Demetrius with the love juice. Puck mistakenly touches the eyes of Lysander, and it is Helena whom he first sees on awakening. Presently the weaver Bottom and his friends come to the wood, prepared to rehearse a play designed for the wedding festivities of Theseus and Hippolyta. The mischievous Puck puts an ass's head on Bottom, and he receives the dainty Titania's affection.

To add to the complications, Oberon touches the eyes of Demetrius with the love juice, and when he awakens, he begins to quarrel with Lysander, whom he sees making love to Helena. The tangle is straightened out when Puck removes the spell from Lysander's eyes and Oberon releases Titania. Bottom, himself again, is permitted to depart. Theseus and Hippolyta, hunting in the forest, find the happy lovers, and invite them to a wedding feast at the palace. After the feast, the guests are entertained by a performance of *Pyramus and Thisbe*, played by Bottom and his rough companions.

**Othello.** This tragic study of the power of jealousy is one of Shakespeare's masterpieces. Othello, a Moorish general, has won the gentle Desdemona, daughter of a senator of Venice. Othello is ordered to Cyprus to fight the Turkish fleet, and arranges to have his wife brought there by Iago, a man of great craftiness and evil. Iago is jealous because Othello has made Cassio his chief lieutenant, and resolves to destroy the happiness of the

newlyweds. At Cyprus, Iago gets Cassio drunk and involved in a street brawl, and thus brings about his dismissal.

Iago hints that Desdemona and Cassio are in love, and arranges to have Othello overhear Cassio ask Desdemona to intercede for him. Her innocent plea adds color to the evil suggestions planted in Othello's mind, and when he sees Cassio give a street woman a handkerchief he himself had given Desdemona (which Emilia, Iago's wife, had stolen and dropped in Cassio's room), Othello is tortured by his jealousy and believes the detestable story. Othello orders Iago to get rid of Cassio, and enters his wife's room. After pouring forth his suspicion, he strangles her while she protests her innocence. Too late he learns from Emilia her own part in the tragedy, and the story of her husband's villainy. The furious Iago stabs Emilia, and in turn is wounded by Othello. Then the Moor, who "loved not wisely, but too well," kills himself. Cassio, who has escaped with a slight wound, becomes governor of Cyprus, and Iago is led away to well-deserved torture and death.

**Richard III** is the last of the plays dealing with the Wars of the Roses. Richard, Duke of Gloucester, the leading role, has been played by some of the greatest actors of all time. The daring of Richard knows no bounds. He has taken part in the murder of Henry VI and of the late king's son, Prince Edward, and now plots to win the throne occupied by the feeble Edward IV. He has his brother George, Duke of Clarence, imprisoned in the Tower and killed there. He brazenly woos the Lady Anne, widow of the slain Prince Edward, even while she is following the funeral procession of her father-in-law, Henry VI. Though Richard is ugly and deformed, he wins his suit by sheer force of personality. King Edward dies, and Richard manages to get himself crowned king, while the two young sons of Edward are held prisoners in the Tower.

Richard's ally, the Duke of Buckingham, is shocked by the king's cruel command to murder the young princes, and angered by the king's refusal to make him an earl. So he joins Richard's strong enemy, Henry, Earl of Richmond, a member of the House of Lancaster. Richard is seeking the hand of Elizabeth, daughter of Henry IV, having previously arranged for the death of Queen Anne. He is then told of the arrival of Richmond. At Bosworth Field, the night before the battle that decides his fate, Richard dreams that the ghosts of all those he has murdered pass before him and bid him despair. The next day his forces are defeated, his horse is shot from under him, and he is slain by the hand of Richmond, who becomes Henry VII. See EDWARD; HENRY; RICHARD; WARS OF THE ROSES.

**Romeo and Juliet.** This story of the most famous of lovers will always be a favorite. In Verona live the Capulet and Montague families, who are bitter enemies. Young Romeo, heir of the Montagues, goes masked to a ball given by Lord Capulet, and there meets and falls in love with Juliet, heiress of the Capulets. Her relative Tybalt would have killed him, but is prevented by Capulet. On her balcony, at night, Juliet tells of her love for Romeo, and is answered by her lover, watching below. The next day they are secretly married in the cell of the friendly Friar Laurence. On his return from the wedding, Romeo meets Tybalt in conversation with his own friends, Benvolio and Mercutio. Tybalt wishes to fight Romeo for having attended the Capulet ball, and when Romeo refuses, Mercutio fights in his place, and is killed. In revenge, Romeo kills Tybalt.

Romeo is banished for killing Tybalt. Juliet's father, who suspects nothing, tries to force her to marry her kinsman Paris. Juliet is advised by Friar Laurence to pretend to agree, and he promises that he will get for her a potion on the wedding day that will give her, for the time being, the appearance of death. He further plans to have her placed in the burial vault, from which

Romeo will rescue her. But their plans go wrong. Before the friar can communicate with him, Romeo hears that Juliet has died. In his despair, he goes to her tomb, drinks poison, and dies by her side. When she awakens and finds his dead body, she seizes his dagger and plunges it into her breast. The tragedy of the young lovers is followed by a reconciliation between the hostile families.

**Taming of the Shrew** is one of the wittiest of the Shakespearean comedies. It is supposed to be played by strolling actors in the effort to drive away the melancholy of a drunken tinsmith, picked out of the street and placed in the luxurious bed of a rich lord, as sport for the household. The shrew with the cutting speech, Katherine, is the daughter of a rich gentleman of Padua, named Baptista. Before her father will consent to the marriage of his gentle daughter Bianca, he insists that someone must marry the daughter with the shrewish temper. Among Bianca's suitors is a student, Lucentio, who disguises himself as a tutor and becomes her teacher.

Meanwhile, Petruchio, a gentleman of Verona, is tempted by Katherine's wealth, and decides to woo her. He wins the father's consent and sets the wedding day, but comes late to the ceremony, appears finally in outrageous clothes, acts like a boor, and refuses to stay for the wedding feast. At home he roars at the servants, beats them without cause, refuses to let Katherine eat the food they prepare, which he claims is not good enough for her, or to wear the new clothes brought by the tailor. In general, he gives a realistic picture of a person with a most villainous temper. So well does he play this part that Kate is utterly subdued, and becomes a model of wifely obedience. In the course of these events, Bianca runs off and marries her tutor, while Lucentio's servant Tranio, masquerading as the real Lucentio, obtains her father's consent to marry her himself. As an added touch, the drunken tinsmith is supposed to find these farcical incidents very dull entertainment.

**The Tempest.** This beautiful fantasy represents the genius of a matured and mellowed Shakespeare. A vessel is tossing in heavy sea near the shore of an enchanted island. On it live Prospero, his beautiful daughter Miranda, the fairy sprite Ariel, and Caliban, a misshapen monster who is Prospero's slave. As they watch the shipwreck, Prospero tells Miranda that twelve years before, as Duke of Milan, he had been deposed by his brother Antonio and his ally, the king of Naples, and cast adrift in a small boat with his three-year-old daughter. A good friend, Gonzalo, put food and water in the boat, together with some books of magic, by aid of which he has been able to command men, spirits, and the weather. Through this power, he had freed Ariel from the spell of the evil hag Sycorax, Caliban's mother, whom he found on the island when their boat reached its shores.

As Prospero and Miranda talk, Ariel comes with news that all on the wrecked ship have been saved, and the play then pictures their adventures on the island. The castaways include Antonio; Alonzo, king of Naples; Alonzo's son Ferdinand; and sailors and courtiers. Ariel's magic brings Ferdinand and Miranda together, discovers a plot hatched by Caliban and two drunken sailors, and brings before Prospero his former enemies and their companions. In the end, Prospero graciously forgives them, is promised the restoration of his dukedom, and, giving up magic, plans to return to Naples. There, he tells Miranda, she and Ferdinand will be married. The faithful Ariel is made joyful by news of his freedom.

**Twelfth Night.** The gay spirit of the twelfth night after Christmas, from which the play gets its name, fills this delightful comedy. It tells the adventures of the twins, Sebastian and Viola, who become separated in a shipwreck. In a seaport city of Illyria, Viola, dressed as a page, enters the service of the Duke of Orsino. He sends her to plead his suit before the wealthy Olivia, but the

lady falls in love with the page, called Cesario. The page, meanwhile, learns to love Orsino. The comic scenes, which make this play hilariously entertaining, are carried on by Olivia's uncle, Sir Toby Belch; Sir Andrew Aguecheek; Malvolio the pompous steward, and other servants. Sir Toby, Sir Andrew, and Maria, Olivia's maid, cause Malvolio to make a fool of himself by sending him a love letter containing ridiculous directions, which he thinks Olivia has written. He follows these regulations so conscientiously that Olivia has him shut up as a madman. Sir Andrew, who desires Olivia for himself, is disturbed by the lady's attentions to the page, and, urged on by the fun-loving Sir Toby, challenges Viola to a duel.

The combat is ridiculous because of the terror of both of the duelists. It is interrupted by the entrance of Captain Antonio, who has come to Illyria with Sebastian. Captain Antonio supposes it is Sebastian himself who is in trouble, and interferes. Viola runs away, and the fight is continued by the real Sebastian, who soon drives off Sir Andrew. Olivia presently marries Sebastian (thinking him the page), and there is a subsequent mix-up when Olivia calls Viola her husband. The appearance of Sebastian and explanations all around clear up matters. The duke discovers his page is a woman, and realizes that he loves her. Malvolio is released, and swears revenge on the "whole pack" of them.

**Related Subjects.** The reader is also referred to:

Avon River	Hathaway, Anne
Blank Verse	Holinshead, Raphael
Elizabeth	Kittredge, George L.
English Literature	Macbeth
(The Tudor Period)	Stratford-on-Avon
Folger Shakespeare Library	

#### SOME FAMOUS SHAKESPEAREAN ACTORS AND ACTRESSES

Aldridge, Ira Frederick	Kean
Arthur, Julia	Kemble, "Fanny," Frances A.
Bernhardt, Sarah	Mantell, Robert Bruce
Booth	Marlowe, Julia
Evans, Maurice	Modjeska, Helena Opid
Forbes-Robertson	Salvini, Tommaso
Forrest, Edwin	Siddons, Sarah Kemble
Garrick, David	Sothern, Edward Hugh
Hampden, Walter	Terry, Ellen Alicia
Irving, Henry, Sir	Tree, Herbert Beerbohm, Sir

#### Books about Shakespeare

As has been noted, there are many thousands of books which deal entirely or partly with Shakespeare. Many of them are written for scholars and assume that the reader already has a wide knowledge of Shakespeare and his work. But hundreds are written for general readers. The lists which follow record some of the books which will be most helpful to young people, average adult readers, and teachers who expect to teach some of Shakespeare's plays.

#### Books for Younger Readers

BENNETT, JOHN. *Master Skylark*. Century, 1922. A story of Shakespeare's time. One of the best-known pieces of fiction about Shakespeare.

LAMB, CHARLES, and LAMB, M. A. *Tales from Shakespeare*. (McKay's il. classics.) McKay, 1944. Popular retelling of Shakespeare's best plays for children.

MACLEOD, MARY. *The Shakespeare Story-Book*. Barnes, A. S., 1902.

WHITE, ANN TERRY. *Three Children and Shakespeare*. Harper, 1938. Readings from *The Merchant of Venice*, *A Midsummer Night's Dream*, and *The Taming of the Shrew*.

## Books for Older Readers

- ADAMS, JOSEPH QUINCY. *A Life of William Shakespeare*. Houghton, 1923. This book is the standard life of Shakespeare.
- BRADLEY, A. C. *Shakespearean Tragedy*. Macmillan, 1914. Critical discussions of Shakespeare's greatest plays.
- BROPHY, JOHN. *Gentleman of Stratford*. Harper, 1940. Novel of Shakespeare's life, which keeps close to the known facts.
- BYRNE, M. ST. CLARE. *Elizabethan Life in Town and Country*. Methuen, 1934. Everyday life of English people in Shakespeare's time.
- HARBAGE, ALFRED BENNETT. *Shakespeare's Audience*. Columbia Univ. Press, 1942. The behavior, social strata, and intellectual and aesthetic capacities of Shakespeare's audiences.
- KNIGHT, GEORGE WILSON. *Olive and the Sword; a Study of England's Shakespeare*. Oxford, 1944. A picture of England in Shakespeare's time.
- SHAKESPEARE, WILLIAM. *Complete Works*. The Cambridge Edition text as edited by William Aldis Wright, including the Temple notes. Blakiston, 1945.
- SPENCER, HAZELTON. *Art and Life of William Shakespeare*. Harcourt, 1940. The life and works of Shakespeare, with a history of the Elizabethan stage.
- SPRAGUE, ARTHUR COLBY. *Shakespeare and the Actors; the Stage Business in His Plays*. Harvard Univ. Press, 1944. A careful study of how one man thinks Shakespeare's plays should be, and were, acted.
- STOLL, ELMER EDGAR. *Shakespeare's Young Lovers*. Oxford, 1937. Consists of three fine essays: "Romeo and Juliet"; "Maidens of Shakespeare's Prime"; "Maidens in the Dramatic Romance."
- WEBSTER, MARGARET. *Shakespeare Without Tears*. McGraw, 1942. Written by an actress and director of Shakespearean plays. Discusses problems of producing. Contains notes on Elizabethan stages, and solves many problems.

## Books for Teachers

- BRANDES, GEORGE MORRIS COHEN. *William Shakespeare*. Macmillan, 1936. One of the most authoritative biographies.
- CHAMBERS, E. K. *The Elizabethan Stage*. 4 vols. Oxford, 1923. Most authoritative reference book on the plays and theaters of Shakespeare's time. *William Shakespeare*. 2 vols. 1930. Most authoritative reference book on the man and his work.
- FRIPP, EDGAR INNES. *Shakespeare; Man and Artist*. 2 vols. Oxford, 1938. The fullest study of Shakespeare since Sir Edmund Chambers.
- GORDON, G. S. *Shakespeare's English*. Society for Pure English Tracts. No. 29. Oxford, 1928. Characteristics of Shakespeare's language and its influence on modern English.
- HARTLEY, DOROTHY, and ELLIOT, MARGARET M. *The Life and Work of the People of England*. Vol. II (1500-1800). Putnam, 1926. A pictorial record from contemporary sources. Nearly 500 illustrations from contemporary life.
- IRVINE, THEODORA URSULA. *Pronouncing Dictionary of Shakespearean Proper Names*. Barnes & Noble, 1944. (College Outline series.)
- KNIGHT, GEORGE WILSON. *Imperial Theme; further interpretations of Shakespeare's Tragedies, including the Roman Plays*. Oxford, 1931. *Wheel of Fire; Essays in Interpretation of Shakespeare's Sombre Tragedies*. 1930.
- ODELL, GEORGE C. D. *Shakespeare from Betterton to Irving*. 2 vols. Scribner, 1920. Records of performances of Shakespeare's plays.
- THORNDIKE, A. H. *Shakespeare's Theater*. Macmillan, 1916. London theaters of Shakespeare's time and their use.
- WATT, HOMER A., and others. *Outlines of Shakespeare's Plays*. Barnes & Noble, 1945. (College Outline series.)

## Outline

- I. Greatest Dramatist of All Time
  - A. Qualities of his genius
  - B. Influence on the English language
- II. Shakespeare's Life
  - A. Early years
  - B. Marriage
  - C. Actor and playwright
  - D. Poet
  - E. Theater companies
  - F. Financial success
  - G. Activities
  - H. Later years
  - I. Portraits
- III. Shakespeare's Works
  - A. Periods of development
  - B. Types of plays
    1. Histories
    2. Tragedies
    3. Comedies
  - C. Plots
  - D. Characters
  - E. Famous quotations
  - F. Nondramatic works
    1. Narrative poems
    2. Sonnets
  - G. Theories of authorship
- IV. Shakespeare, a Man of His Own Time
  - A. Great Elizabethans
  - B. London of Shakespeare's day
  - C. Influence of the new world
  - D. The audience
  - E. Music
  - F. Theaters
  - G. Stage properties and costumes
  - H. Women's parts
- V. Editions of Shakespeare
  - A. First quarto
  - B. First folio
  - C. Later edition
  - D. Popular editions
- VI. Shakespeare through the Ages
- VII. Memorials

## Questions

What is the only work that has been translated into more languages than Shakespeare's writings?

In what way did Shakespeare have an important influence on the English language?

How was Shakespeare able to portray such a wide range of characters with fitting emotions, speech, and conduct for each?

Why did Shakespeare turn to poetry writing in 1592?

Into what groups are Shakespeare's plays usually divided? What is an example of each type?

In what ways may the great dramatist be described as a man of his own time?

Why has there been any argument about the authorship of the plays?

What other great man lived in England during Shakespeare's lifetime?

Why was so much music used in Shakespeare's plays?

Which are usually considered the two greatest of Shakespeare's nondramatic works?

How many sonnets is Shakespeare thought to have written?

How did the playhouse of Shakespeare's day differ from a modern theater? What effect did this have on the playwright as he wrote the play?

Why was costuming especially important in Shakespeare's time?

Who are some famous Shakespearean actor modern times?



**SHALE**, *shale*, is a common rock that can be split into slabs. It is made of the same material as clay, but is harder. Shale is a sedimentary rock and is found in layers, often together with layers of sandstone or limestone. When a slab of shale is broken off, the split is roughly parallel to the surface of the layer. In some places, heat and pressure have changed the shale to slate.

Like clay, shale is ground up in manufacturing bricks and Portland cement. Bituminous shale is rich in petroleum and related substances. It burns with a flame, and the petroleum can be distilled off.

W.H.Bu.

See also OIL SHALE; SLATE.

**SHALER, NATHANIEL SOUTHGATE** (1841-1906), was an American geologist who was best known as a teacher and author. He was born in Newport, Ky. He was graduated from Harvard University during the War between the States, and he served for two years as an artillery officer in the Union Army. In 1869 he returned to Harvard as a teacher of geology. In his lectures he related geology to the history of life on earth. He also related geology to human thought, industrial progress, and geography. Shaler was state geologist of Kentucky from 1873 to 1880. In 1884 he joined the Atlantic Coast division of the United States Geological Survey.

C.L.F.

His Works include *Man and the Earth; First Book in Geology; Outlines of Earth History; and A Study of Life and Death*.

**SHALLOT** is a plant of the onion family. The shallot plant is smaller than the onion plant and has long slender leaves. The bulbs are shaped like small pears and grow in bunches, or clusters. The bulbs may be red, brown, or gray. Shallots have a fine flavor that is stronger than that of onions but not as sharp. For this reason, they are often used in flavoring sauces, cooked foods, and pickles.

L.A.So.

**Classification.** The common species of shallot is *Allium ascalonicum*.

**SHALMANESER III** (about 830 B.C.). See ASSYRIA (History and Government).

**SHALYAPIN**, *shoo LYAH pyin*, **FEODOR**. See CHALIAPIN, FEODOR IVANOVITCH.

**SHAMAN, SHAH man**. See SHAMANISM.

**SHAMANISM, SHAH man iz'm**, is a religion practiced by primitive peoples. It is based on the belief that the *shaman*, or witch doctor, can drive off evil demons and spirits and bring good to his subjects. Dances, feasts,

and chants make up some of the ceremonies. The shaman often gives herbs as medicine to the sick. The word *shamanism* was first used to describe the religion of tribes in Siberia. The North American Indian, with his medicine man, had similar beliefs. See also INDIAN, AMERICAN (Religion).

W.D.W.

**SHAMROCK** is the national flower of Ireland (Eire). According to legend, St. Patrick planted the little plant in Ireland because its three small leaves represented the Holy Trinity. All loyal sons of Eire still wear a shamrock in their lapel on St. Patrick's day. The name *shamrock* is anglicized from *Seamrog*, which means trefoil (three-leaved). It is given to a number of plants, but a small clover is usually considered the true shamrock. Its leaves are a beautiful blue-green color, each made of three leaflets. *Black medic*, *nonesuch*, *yellow trefoil*, and *hop clover* all have been called shamrocks. The shamrock appears with the thistle and the rose on the British coat of arms, for these are the flowers of Ireland, Scotland, and England.

Some authorities say that the wood sorrel is the true shamrock. Its leaves are very much like those of the white clover.

A.C.Ho.

See also FLOWER (National Flowers).

**SHAN, shahn**. See BURMA (People).

**SHANG DYNASTY**. See CHINA (History of China).

**SHANGHAI, shang hie** (population 3,489,998), is the largest city in China and the fourth largest city in the world. In 1842 Shanghai was a small market village in the mud flats of the Whangpoo River, just to one side of the Yangtze River. In that year, a British warship came to Shanghai and forced the Chinese to allow foreign traders to build a settlement there. The foreign businessmen who came to Shanghai after 1842 turned the tiny village into a sprawling city of enormous trade and industry. Today almost half of China's foreign trade passes through Shanghai's harbor. China's largest banks line the city's waterfront, called the *Bund*.

**Location and Size.** Shanghai is a great port, although it is not on the sea. Its name means *up from the sea*. It is on the bank of the Whangpoo River, about fourteen miles above where it empties into the great Yangtze. Constant dredging keeps the river deep enough for ocean vessels. Docks and warehouses line the river bank.

Shanghai developed as three cities. These were the International Settlement, the French Concession, called "Frenchtown," and the Chinese City. The International Settlement was built up along the Whangpoo River

(center) is usually considered the true shamrock, and is the best known. At the right is the leaf of wood sorrel.

Rutherford Platt; J. Horace McFarland



bank. Its skyscraper banks, hotels, and office buildings give Shanghai a modern skyline. Several buildings are more than twenty stories high. The French Concession has smaller office buildings and shops and many fine residences. The municipality of Greater Shanghai surrounded Frenchtown and the International Settlement. This area is a collection of suburban towns. It includes the old Chinese walled city of Shanghai, Pootung across the river from the city, Nantao to the south, and Chapei, Hongkew, and Yangtzepoo to the north. The international areas are modern, with wide streets and good buildings. Parts of the Chinese areas have narrow streets lined with small, poorly built structures. Other parts are completely modern. The Municipality today includes all of Shanghai, because foreign government ended with World War II.

**Industry and Trade.** Since Shanghai is near the Yangtze River, it is the center of trade for all of Central China. The chief trade is in textiles. Imports include raw cotton, petroleum products, metal goods, sugar, tobacco, and chemicals. From Shanghai, China ships cloth, animal hides, eggs, and silk. Great industries have grown around Shanghai. Most of them were first financed by foreigners, but have now been taken over by the Chinese. Textiles make up about 40 per cent of the manufactures. Other industries include sugar refining, the manufacture of cement and soap, shipbuilding, and publishing.

**History and Government.** After the British started their settlement at Shanghai in 1842, the city grew rapidly. The United States was assigned a concession to the north, but never accepted it. The French were assigned a concession on the south. In 1863 the British and American areas were combined into the International Settlement. This area was not under the control of any one nation. People of all countries were allowed to buy property and conduct their trade there. The Settlement was governed by a council of thirteen members, elected by the taxpayers. Only about 5,000 persons were allowed to vote. Before World War II, about 97 out of every hundred of the Settlement's residents were Chinese, but most of the Council members were British. Troops of different countries guarded sections of the Settlement. The French Concession was governed by the French consul general. A Chinese mayor governed the Chinese City.

Rebels attacked Shanghai during the Taiping Rebellion of 1860 and again during the Boxer Rebellion of 1900. The city was besieged by Chiang Kai-shek's troops in 1927. The Japanese fought the Chinese at Shanghai in 1932 and destroyed large parts of the Chinese City. These areas were rebuilt only to be destroyed once again by the Japanese in 1937. After Japan declared war on the United States and Great Britain in 1941, Japan occupied Shanghai and held the city until the end of World War II. During the war the United States and Britain gave up their privileges in China. After the Japanese surrender, the Chinese took over the International Settlement. The French gave up their concession in 1946. Today Shanghai is controlled entirely by the Chinese.

G.B.Ck.

See also **ASIA** (color plate, Water Carriers of Shanghai); **BOXER REBELLION**.

**SHANNON, MONICA** ( ? - ), is the author of *Dobry*, which won the Newbery medal in 1934. This story about a Bulgarian peasant boy is based on the life of the sculptor, Atanas Katchamakoff, who illustrated the book.

Monica Shannon was born in Belleville, Ontario, Canada, but spent her childhood on a ranch in the Bitter Root Mountains of California. Both her parents were Irish, and from them she heard many Irish songs and fairy tales. Later she told stories to children in the Los Angeles Public Library. After the publication of *California Fairy Tales*, she became well known as a children's writer. See also **NEWBERY MEDAL**.

F.C.

**Her Works** include *More Tales from California*; *Goose-Grass Rhymes*; and *Taunymore, a Tale of California*.

**SHANNON RIVER**, is the main waterway of Eire, and the longest river in the British Isles. The Shannon rises in Cavan County in upper Leinster, and flows 250 miles southwest to its mouth in the Atlantic Ocean. Much of the Shannon's course is through beautiful lakes, called *loughs*. The mouth, or estuary, of the Shannon is fifty miles long. Limerick is the chief city on the Shannon. An electrical power project on the Shannon was completed in 1929.

W.R.McC.

**SHANTUNG**, *shahn doong*, is a province in north-eastern China. It covers an area of 69,198 square miles, and has a population of 38,029,294. Shantung is important chiefly as a wheat-growing center. Its main industries are centered in the seaport Tsingtao.

**SHANTUNG**, *shan TUNG*, is a heavy grade of pongee (wild silk) woven in China. Shantung made of cotton, rayon, or cotton and silk mixtures imitates the silk fabric. Rough spun yarns of these fibers give the same effect as silk. Shantung has a plain weave, and is used in making curtains, sportswear, women's summer suits, pajamas, and robes. Shantung comes in 33- and 50-inch widths.

G.G.Da.

**SHAPLEY, SHAP lih, HARLOW** (1885- ), is one of the most famous of living astronomers. He was born at



**Harlow Shapley**, American student of the universe

Nashville, Mo., and was educated at the University of Missouri and Princeton University. From 1914 to 1921 he was astronomer at the Mount Wilson Observatory, California. In 1921 he became professor of astronomy at Harvard University and director of the Harvard Observatory.

At Mount Wilson, Shapley studied the "globular" clusters of stars. Some of these lie at the edge of the Milky Way, which is the galaxy to which our solar system belongs. His studies show that the Milky Way's diameter is about 300,000 light years. Shapley also found that the center of the Milky Way is near the constellation of Sagittarius, about 40,000 light years from the sun. Besides making these discoveries, he studied galaxies which lie far beyond the Milky Way.

C.L.F.

See also **MILKY WAY**.

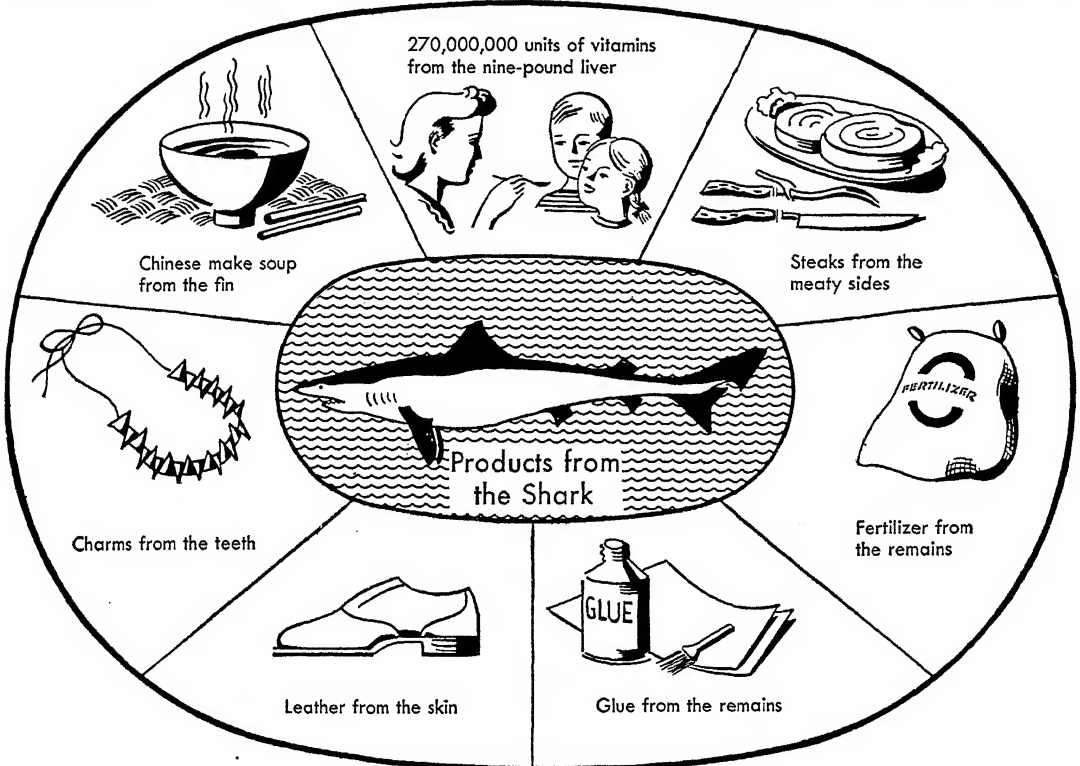
**SHAPOSHNIKOV, SHAH** *paush nyih kawf*, **BORIS MIKHAILOVICH** (1882-1945), was considered the leading military strategist of the Soviet Union in his time. He was born in Zlatoust in the Ural Mountains. At the age of nineteen, he entered the Moscow Military School, and by 1905 had become a lieutenant. During World War I he served as an aide to Grand Duke Nicholas on the Caucasian front.

By the time of the Bolshevik Revolution in 1917, Shaposhnikov was a colonel. In May, 1918, he joined

COTTON (Economic Problems of the Cotton Grower).

**SHARK.** Sharks are the greediest eaters and killers of the sea animals. They live in all parts of the ocean, but are most numerous in warm seas. Sharks have rounded bodies which may be forty feet long. They are covered with scales which give the skin a rough feeling when the hand is rubbed forward along the fish.

The shark's mouth is on the underside of the head. It is often said that sharks have to turn over on their backs to bite, but this is not true. Some kinds of



the Red Army and helped direct the fight against the Russian and foreign enemies of the revolution. Later he rose steadily in the ranks of the army. In 1930, he joined the Communist party and later became an alternate member of the party's Central Committee.

From 1928 to 1931, Shaposhnikov was chief of staff of the Red Army. In 1932, he was appointed head of the Frunze Military Academy, where the Red Army's officers are trained. He served again as chief of staff from 1937 to 1940. During this period he planned the Soviet invasion of Finland and of Eastern Poland. In 1940, he was given the rank of marshal. At the time of the German invasion of the Soviet Union in 1941, Shaposhnikov again became chief of staff. A year later ill health forced him to retire.

A. PARR.

**His Works** include the notable three-volume study of the General Staff, *The Brain of the Army*.

**SHARE.** Each of the parts into which ownership in a corporation is divided is called a *share*. The share is the certificate for money invested in a company. See CORPORATION; STOCK, CAPITAL.

**SHARE CROPPER**, a special type of tenant farmer. See

sharks have several rows of long, sharp teeth, with all the rows except one or two folded back on the jaws. As each tooth is lost, another grows in its place. Other sharks have broad, flat teeth, and in a few varieties, the teeth are small. Shark's gills are on the sides of the head and have five to seven openings on the surface. The tail is usually notched. The upper part of the tail is longer than the lower part.

Sharks are rapid swimmers. They often follow ships for days at a time to get the food and waste matter that are thrown overboard. They eat small fish of all kinds and do great damage to man's supply of fish food.

Certain sharks are vicious and greedy. Some authorities say that they are not so "mean" as they seem, but suffer from continual hunger. Their stomachs will not let them rest. Almost as soon as they eat they must be off after more food. They have been known to swim within a few hundred feet of beaches in Southern resorts, waiting for adventurous bathers.

The largest shark is the harmless *whale shark*, which is often more than fifty feet long. Fortunately for bathers and sailors in southern waters, it feeds only on



American Museum of Natural History

**The Whale Shark** is the largest member of the shark family. This baby was caught in Florida. It measured 33 feet and weighed over 15 tons. Whale sharks have jaws wide enough to swallow a man, but they lead quiet lives in the warm sea, eating seaweed and small surface fish.

small sea animals and plants. The next largest is the *basking shark*, another harmless fish. It is found mainly in the Arctic Ocean, and gets its name because it likes to come to the surface and bask in the sun. One of the best-known species is the *white shark*, which is a man-eater. It lives in the tropical seas, and sometimes along the southern coasts of the United States. Another shark which preys on man is the *blue shark*, named for its color. This greedy fish often follows smaller fish into fishermen's nets, trying to catch them.

Some sharks are called *hammerheads* because their heads are shaped like a hammer. Among the many other species are the *dusky*, *porbeagle*, *bullhead*, and *dog* sharks. The *leopard* shark has spots like a leopard and eats mostly fish.

Some sharks have their young by laying eggs which are protected by a horny shell. But most sharks bear live young, from three to six or more in a brood. Some of the young are born quite large in comparison with their parents. For example, the female *black-tip shark* is usually five feet long. Her young are about one and a half feet long at birth.

**The Shark Industry.** The Norwegians have long been specialists in shark fishing. These fish form the basis of several thriving industries in Norway. The heads of the sharks are made into glue. The flesh is used to make an excellent fertilizer. Leather is made from the hides, and "cod-liver" oil from the livers.

Shark fisheries have been established in Florida, along the Gulf Coast, in the Virgin Islands, and along the Pacific Coast of North America. The fish are caught on very strong hooks fastened to chain leaders with a heavy line. Rope nets also are used.

The flesh of some species of shark is used as food. Much shark flesh is salted and exported to parts of Africa. But shark flesh has not come into general use in America, where fish of much finer flavor are plentiful. Dried shark fins are considered a great delicacy in China. The skin is marketed for shoes, purses, pocketbooks, and other articles under the name

of *shagreen*. It is sometimes used like sandpaper for polishing. See also DOGFISH; REMORA.

**Classification.** All the shark families are in the order *Selachii*. L.P.Sc.

**SHARK SUCKER.** See REMORA.

**SHARON, SHAR un, PLAIN OF.** See PALESTINE (Location, Size, and Surface Features).

**SHARON, ROSE OF.** See HIBISCUS.

**SHARP, DALLAS LORE.** See MASSACHUSETTS (Famous Men and Women).

**SHARPS AND FLATS.** See MUSIC (Elements of Music).

**SHASTA, MOUNT,** is a lofty, snow-covered, cone-shaped mountain in the Cascade Mountains, north of the Sierra Nevada range of California. Mount Shasta towers 10,000 feet above the plains of the Sacramento Valley. Though its height above sea level (14,380 feet) is less than that of several other peaks in the United States, Mount Shasta appears to be higher, for it rises so high from its base. For instance, Mount Whitney (14,496 feet) rises only about 3,000 feet above its base.

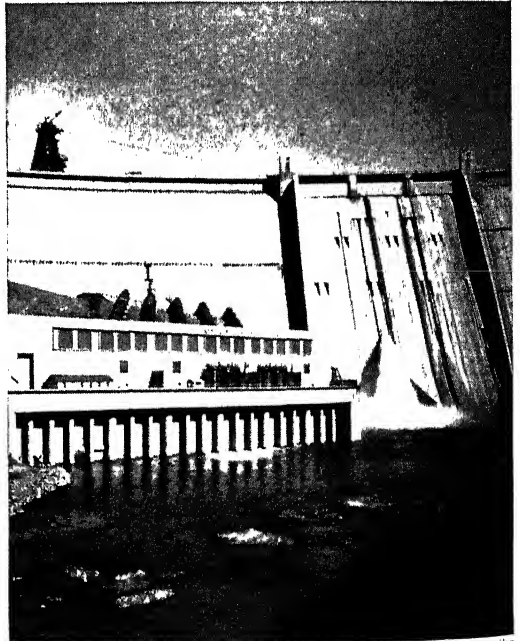
Mount Shasta is a product of the great volcanic activity which took place in the whole Cascade range thousands of years ago. Crater Peak, or Shastina (12,000 feet), the westernmost of Mount Shasta's twin peaks, has a crater at its top about three fourths of a mile across and 2,500 feet deep.

On the northern slope of the mountain are several large glaciers. L.D.Jr.

See also MOUNTAIN (illustration, Highest Mountains of the World).

**SHASTA DAISY.** See BURBANK, LUTHER (Achievements); DAISY (illustration).

**SHASTA DAM,** located in the Sacramento River about 12 miles north of Redding, Calif., is the second



U.S. Bureau of Reclamation

**Massive Shasta Dam** rises more than 600 feet from the bed of the Sacramento River in northern California.

largest concrete dam in the world. The dam is the main feature of the Central Valley Project in California. The spillway drops 480 feet, making it the highest overflow type dam in the world. The reservoir created by Shasta Dam provides irrigation water and electric power production. The dam is 602 feet high, with a crest length of 3,500 feet and it contains 6,000,000 cubic yards of concrete. The reservoir extends 35 miles from the dam up the Sacramento, Pit, and McCloud rivers. It has a capacity of 4,500,000 acre feet. Shasta Dam was built by the United States Bureau of Reclamation and was substantially completed in 1944. See also DAM.

**SHATT AL ARAB**, *shah al ah rahb*. See EUPHRATES RIVER; TIGRIS RIVER.

**SHAUGHNESSY, SHAW neh sih**, **THOMAS GEORGE, BARON** (1853-1923), was president of the Canadian Pacific Railway from 1899 to 1918. He also served as a director of many other corporations. Shaughnessy was born in Milwaukee, Wis. H.U.F.

**SHAW, ALBERT** (1857-1947) founded in 1891 the *Review of Reviews*, a current-events magazine which he edited for forty-six years. This magazine was later combined with the *Literary Digest*, and Shaw remained as editor for a time before he retired in 1937.

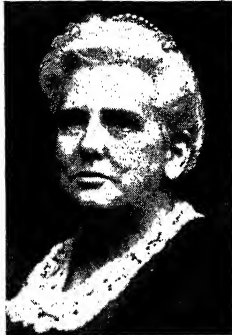
Shaw was born at Shandon, Ohio, and was graduated from Iowa (now Grinnell) College. He worked several years as an editorial writer on the *Minneapolis Tribune*. Shaw became well known as a writer on economics and municipal government, and as a lecturer. E.S.W.

**His Works** include *Icaria—A Chapter in the History of Communism*; *Municipal Government in Great Britain*; *The Business Career*; and *Abraham Lincoln*.

**SHAW, ANNA HOWARD** (1847-1919), was an American Methodist preacher who was active in the woman-suffrage movement. She was born in Newcastle-on-Tyne, England, and moved to the United States in 1851. She was educated at Albion (Mich.) College, and at Boston University, where she received a degree of doctor of medicine in 1886.

In 1880 she had been ordained a minister by the Protestant Methodist Church. For several years she preached in Methodist Episcopal churches in Massachusetts. But the rules of that denomination did not then permit a woman to be ordained to its ministry.

In 1887, Frances Willard made Anna Shaw national superintendent of the department of suffrage in the Woman's Christian Temperance Union. She was a forceful orator, and soon became a lecturer for the National American Woman Suffrage Association. She served as its president from 1904 until 1915. Two years later, President Woodrow Wilson appointed her chairman of the women's division of the Council of National Defense. Her work with women during World War I helped pave the way for the founding of the Woman's Division of the Department of Labor. R.M.B.



Brown Bros.

**Anna Howard Shaw** worked to get American women the right to vote.

**SHAW, GEORGE BERNARD** (1856- ). Many critics consider Shaw the greatest literary figure of modern times. As a dramatist, novelist, and critic, he is the most effective British satirist since Jonathan Swift. In his plays he attacked the beliefs and conventions of his day in clear and precise prose.

Shaw became a legend in his own lifetime. He is more than just a literary figure. His wit and personality became as well known as his writings. Every movement or statement by him was internationally noted.

The story told about his curtain speech on the first night of *Fanny's First Play* is a typical one. The audience demanded to see the author. Shaw appeared but before he could begin to speak, someone in the balcony hissed. Shaw looked up at the hisser. "My dear sir," he said, amiably, "I thoroughly agree with you. But who are we among so many?"

Shaw was born in Dublin, Ireland, and attended school there. At the age of fifteen he left school to earn his own living. In 1876 he went to London. He became interested in Socialism and used his talents to promote its cause in every way possible. He was an active member of the Fabian Society and one of the best debaters in England.

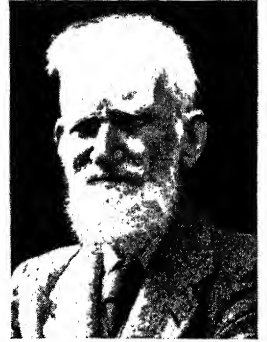
In 1885 he began working as a reviewer for the *Pall Mall Gazette*. Soon he was known as one of the leading music and dramatic critics in London. As a drama critic he grew disgusted with the poor quality of the plays then being presented. He believed that unless something was done about the drama, the English theater was lost. To help the situation, Shaw took to writing plays, and became the most successful dramatist of his time. He also wrote several novels. B.M.

See also ANDROCLAS; FABIAN SOCIETY.

**His Works** include *Caesar and Cleopatra*; *Pygmalion*; *Majors Barbara*; *Saint Joan*; *Candida*; *Mrs. Warren's Profession*; and *Arms and the Man*.

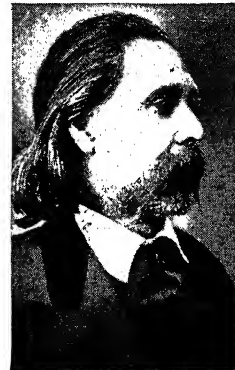
**SHAW, HENRY WHEELER**

(1818-1885), was an American humorist who became famous under the pen name of JOSH BILLINGS. He was born at Lanesboro, Mass., and attended Hamilton College for a year. In 1858 Shaw settled in Poughkeepsie, N.Y., as an auctioneer and real-estate dealer. He also wrote humorous sketches for local newspapers. At first his writings attracted little notice. Finally, in 1860 he wrote an article which he



British Combine

**George Bernard Shaw**, one of the outstanding figures in modern English literature



**Henry Shaw** amused Americans of the mid-1800's with his Josh Billings papers.



called "An Essa on the Muel, bi Josh Billings," which appeared in a New York City paper. Its ridiculous spelling and bad grammar were well suited to Shaw's crackbox philosophy, and at once his articles became immensely popular.

Shaw also was very successful on the lecture platform with his witty sayings and quaint moral lessons. His first book, *Josh Billings, His Sayings*, appeared in 1865. From 1869 to 1880 he issued each year a new edition of *Josh Billings' Farmers' Almanax*. C.M.E.

His Works include *Every Buddy's Friend*; *Josh Billings' Trump Cards*; and *Old Probabilities*.

**SHAWINIGAN**, *SHAW* in ih gan, **FALLS**, Quebec (population 20,325). This industrial center lies on the St. Maurice River, 19 miles north of Trois Rivières and half-way between Montreal and Quebec. The Shawinigan Water and Power Company was formed in 1898 to harness the St. Maurice River for power purposes. This made Shawinigan Falls an important center of industry. The chief products of its many industries are aluminum, paper and pulp, carbide, chemicals, resins, abrasive materials, lumber, and stainless steel products. The settlement was founded during the winter of 1900-1901. It was incorporated as a village in 1901, and as a city in 1921. J.A.D.

**SAWL**. See CASHMERE; DRESS; LATIN AMERICA (color plates); MEXICO (illustration).

**SHAWN**, "TED," EDWIN M. (1891- ), became one of the best known of American dancers. His graceful ballets and his flashing Spanish numbers delighted audiences in all parts of the world for many years.

Ted Shawn was born in Kansas City, Mo., and was educated at the University of Denver. In 1914, he married the dancer Ruth St. Denis. (See ST. DENIS, RUTH.) Together they founded the Denishawn School in Los Angeles, Calif., where they trained their own troupe in the dances they created. This troupe toured America and Europe between 1922 and 1932. In 1933, Shawn organized a group of men dancers which appeared in the United States and England. M.C.C.

His Works include *Ruth St. Denis and Dance We Must*.

**SHAWNEE**, *shaw NE*, was the name of an American Indian tribe of the eastern woodlands. The Shawnee spoke an Algonkian language. These farming people once built their dome-shaped wigwams in what is now eastern Pennsylvania, but they were driven out by the mighty Iroquois. The Shawnee then split up and began a series of wanderings which lasted for two hundred years. Finally the different bands got together in Ohio, which was then a forest wilderness.

Shawnee spent years fighting and making , first with the French and then with the British. they attacked the cabins of early American settlers, in an attempt to drive the whites out of the country. In the early 1800's Tecumseh, a great Shawnee leader, planned a final drive against the whites. He and his brother, called the *Prophet*, tried to unite all the Indians in the Mississippi Valley. They received many promises of help, for Tecumseh was a great orator and a man of real military ability, and the Indians had faith in his ability to help them. But the revolt broke out too soon, when Tecumseh was not there to lead it. His followers, under the Prophet, were completely defeated at

the battle of Tippecanoe in 1811. Tecumseh then went over to the side of the British. He was killed in Canada during the War of 1812. R.M.U.

See also INDIAN, AMERICAN (Table of Tribes); TECUMSEH.

**SHAW UNIVERSITY** is a coeducational Baptist Negro school of liberal arts in Raleigh, N.C. The university puts special emphasis on training for the ministry. Some of the students earn part of their expenses. Shaw was founded in 1865. Its enrollment averages about 600.

**SHAYS' REBELLION**. After the Revolutionary War, discontent was widespread in Massachusetts, as in most of the United States. Small property owners were losing their farms, homes, and businesses because of the high and unfair taxes. Many faced imprisonment because they could not pay their debts. These people, especially the farmers, demanded a lowering of taxes on the poor.

In 1786 and 1787, the unrest grew into an actual revolt. At that time Massachusetts had a property qualification for voting, so that the poor could not hope to secure reforms through the ballot box. In September, 1786, a mob of about six hundred persons, led by Daniel Shays, gathered in front of the courthouse at Springfield, Mass., and threatened the Supreme Court. The mob hoped to keep the court from granting judgments which would allow foreclosures on farms and the imprisonment of debtors. Many of the group, including Shays, had fought in the Revolution.

Skirmishes took place between Shays' followers and the state militia. Conservatives saw the rebellion as a radical plot to overthrow the state government. It was finally put down on January 25, 1788, by Major General Benjamin Lincoln. Daniel Shays escaped to Vermont with a death penalty on his head. He was later pardoned. Similar conditions existed to a lesser degree in Connecticut.

Shays' Rebellion helped to emphasize the necessity for a stronger central government and thereby promoted the adoption of the United States Constitution. It showed that a stronger central government was needed both to suppress uprisings and to improve economic conditions. E.C.BAR.

**SHEARING STRESS**. See STRENGTH OF MATERIALS.

**SHEARS**. See SCISSORS.

**SHEARWATER** is the name of a group of sea birds that live in the oceans. They vary from 12 to 20 inches in length. Shearwaters have long slender wings and usually soar along the waves, flapping only occasionally. While some fly alone, it is common for some kinds to gather in flocks that may include many thousands. They feed on small fish, squids, and small crustaceans. When fishermen clean fish at sea, shearwaters often come to feed on the heads, livers, and other waste. Some shearwaters are grayish black above and white underneath. Others are entirely dark in hue. None are bright colored.

The shearwater comes to shore only to reproduce, usually on an island. Here it lays one large white or yellowish-white egg in a hole dug in the ground, or concealed under rocks. There are many species of shearwater. One of the best known is the *greater shearwater*, which lives in the Atlantic Ocean from near the Arctic Circle to southern South America and South Africa.

# SHEEP

## SHEATHING

Fishermen in the north call it hag or hagdon. Other species of shearwaters that live in North American waters are the *black-vented shearwater*, the *pink-footed shearwater*, the *New Zealand shearwater*, and the *sooty shearwater*. A.W.

**Classification.** Shearwaters belong to the order *Procellariiformes* and the family *Procellariidae*. The genus is *Puffinus*. The greater shearwater is *P. gravis*, the black-vented shearwater is *P. opisthomelas*, the pink-footed shearwater is *P. creatopus*, the New Zealand shearwater is *P. bulleri*, and the sooty shearwater is *P. griseus*.

**SHEATHING, SHEETH** *ing.* See CARPENTRY (How a Carpenter Builds a House [The Outside]).

**SHEBA, QUEEN OF.** See ETHIOPIA; SOLOMON.

**SHEBOYGAN, Wis.** (population 40,638). This lake port at the mouth of the Sheboygan River on Lake Michigan has been called "the city of cheese, chairs, children, and churches." Sheboygan lies in the heart of a rich dairy farming region, not far from Plymouth, which is the cheese marketing center of the United States. Furniture factories and woodworking plants employ a number of the people of Sheboygan. Most of these are home-loving, church-going persons of German-American descent. Eight out of every ten houses in Sheboygan are owned by the families who live in them. Sheboygan's port is lined with coal docks and warehouses. Enamelware is another important product of the city. The first settlement was established here in 1820. Sheboygan was chartered as a city in 1853. E.G.D.

**SHECHEM, SHE kem.** See CITIES OF REFUGE.

**SHEDD, JOHN GRAVES.** See ILLINOIS (Famous Illinois Men and Women).

**SHEDLOCK, MARIE L.** (1854-1935). See STORYTELLING.

**SHEE.** See FAIRY.

**SHEELER, CHARLES** (1883- ), is an American artist. He is noted for his paintings of "machine-age" industrial centers and of early American barns and home interiors. In his pictures, design is more important than recognizable places or structures, and there is little detail. Sheeler was born in Philadelphia and studied at art schools there. M.C.C.

See also PAINTING (great American Paintings, color plate, The American Scene).

**His Works** include "The Upstairs"; "Classic Landscape"; and "Power House."

**SHEEN, FULTON JOHN** (1895- ), is one of the best-known spokesmen of the viewpoint of the Roman Catholic Church in the United States. Through his weekly radio broadcasts, his many books and articles, and his frequent lectures, he has presented the official views of his church to millions of people. He became best known perhaps for his bitter attacks on communism, which he called the only complete philosophy of life aside from Christianity. He also became noted for his instruction of converts to the Roman Catholic faith.

Sheen was born in El Paso, Ill., and studied for the priesthood at Saint Viator College. Later he also studied at the Catholic University of America, at the University of Louvain, Belgium, and at the University of Rome. In 1926 he became a professor of philosophy at the Catholic University of America. S.M.S.

**His Works** include *Old Errors and New Labels*; *Philosophy of Science*; *Freedom Under God*; and *War and Guilt*.



Office of Indian Affairs

**SHEEP** are among the most important animals that man has tamed because they provide both food and clothing. Long before man began to write history, shepherds watched the flocks in the fields to guard them against wild animals. Today sheep are raised in all parts of the world. In Australia there are about fourteen times as many sheep as there are people. In Argentina there are more than three sheep for every person. In many of the Western States of the United States, such as Texas, Montana, Utah, New Mexico, and Idaho, there are more sheep than people. Sheep yield leather as well as wool and meat. There are many by-products, such as glue, tallow, suet, soap, fertilizer, and the catgut which is used in stringing tennis rackets.

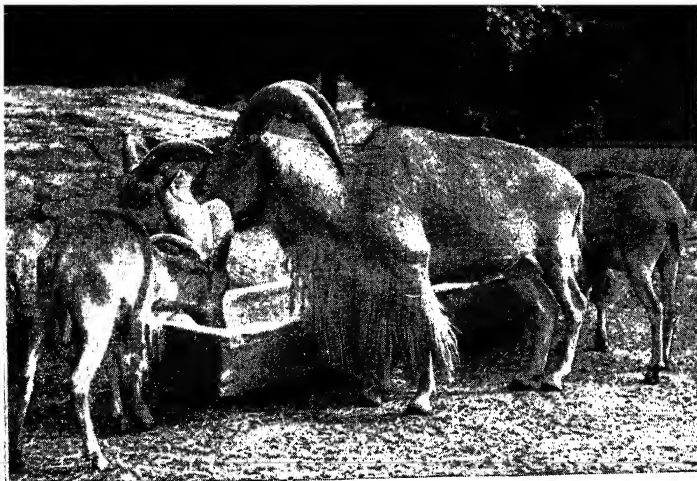
### The Body of the Sheep

Domestic sheep vary greatly in size. The females, or ewes, of some breeds of sheep may weigh as little as a hundred pounds. Other ewes may weigh more than two hundred and twenty-five pounds. The rams, or males, are larger. Their weight, including a heavy coat of wool, ranges from 150 to 350 pounds among the various breeds.

Sheep are different from goats in many ways. They do not have the familiar beard of the billy goat, nor the well-known "goaty" odor. Sheep have a gland between their toes which is not found among the goats. The horns of a ram usually curve outward. In some breeds, both rams and ewes have horns. In others, only the rams have horns.

Sheep walk upon hoofs which are divided into two toes. Their ankles are very slim. The upper part of their legs is muscular. This helps them to leap about quickly and easily, and also provides man with good-tasting roasts.

Sheep have no incisor, or cutting, teeth on their upper jaws, though they have eight on their lower jaws. They have six grinding teeth on the back part of each jaw. Sheep can bite off grass much more closely to the ground than cattle can. In fact, where sheep have eaten their



**Barbary Wild Sheep Come from the Mountains of North Africa**



**The Bighorn of North America**

Hollisher; Newton H. Hartman

fill, there is little plant life left. This was one reason that sheepherders were hated so much by cattlemen in the early days of the settlement of the American West.

Most sheep have tails, but these are cut off for reasons of cleanliness. There is one kind of sheep that lives in Asia, however, which has such a large fat tail that the sheepherders often make a special little two-wheeled cart on which the sheep carries its tail.

Sheep live for about thirteen years. They bear their first young at the age of one year, and have young every year after that. The mother carries the young sheep inside her body about five months before it is born.

#### Wild Sheep

Sheep are originally supposed to have come from the lofty plateaus and mountains of Central Asia. The largest of all the wild sheep, the *argali*, is found in the Altai Mountains of Siberia and Mongolia. The male argali stands four feet high at the shoulders, and his massive horns curve into a spiral twenty inches around.

The great Marco Polo sheep of Asia live on the plateaus of Pamir, the "roof of the world," three miles above

sea level. This sheep was first described by Marco Polo. The Marco Polo sheep is a little smaller than the argali, but it is remarkable for the wide spread of its horns. The *blue sheep*, or *bharal*, which is closely related to the goat, lives in Tibet. About half a dozen other kinds of wild sheep live in Asia.

The *aoudad* lives in North Africa. It has long hair on its breast and forelegs and looks very much like a goat. The mouflon now lives in Corsica and Sardinia. Wild sheep look much like wild goats. Some kinds of wild sheep are thought to be halfway between sheep and goats. Wild sheep are high-spirited, daring, and self-reliant. They brave the fiercest storms of winter and climb to great heights that no other animals but mountain goats dare ascend. They live among the mountains and high plateaus of the Northern Hemisphere. Some wild sheep, however, prefer the slopes and open spaces between the mountains, rather than the rugged cliffs. Like tame sheep, wild sheep live together in bands.

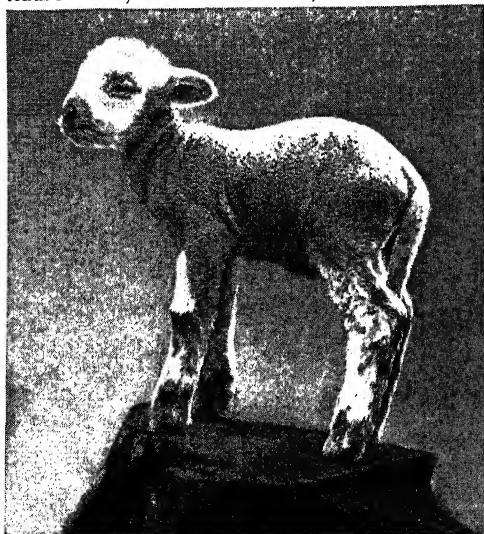
All the domestic breeds of sheep are descended from two different kinds of wild sheep. These are the *wrial* that lives in Southern Asia, and the *mouflon*, which is the only wild sheep still living in Southern Europe. Both of these wild sheep probably look much like their original ancestors. Several kinds of bighorn sheep live in North America.

#### Breeds of Domestic Sheep

Domestic sheep have been slowly and carefully changed from their wild ancestors. Originally, the wild sheep were tamed for the sake of their hides and milk. They were also used to carry burdens. Very early, however, they became important for their fleece. The coarse hair that covered the wild sheep was replaced by a soft coat of wool through breeding. Only in the last two hundred years have breeders developed sheep primarily for their meat.

Sheep are classified into four groups, depending upon their fleece. These are long wool, medium wool, fine wool, and carpet wool. The carpet wool group is of little importance.

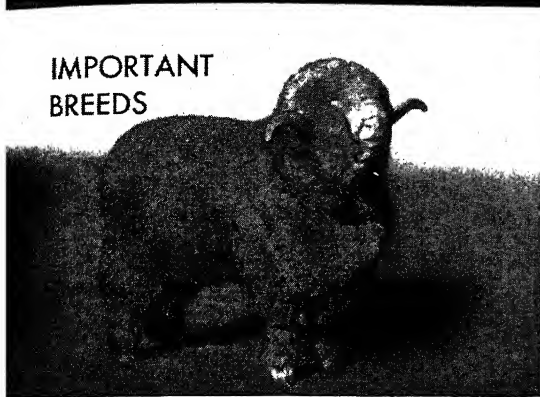
**Fine-Woolled Sheep.** Most of our fine-wooled sheep originated from the Spanish Merino. These sheep were raised in Spain as far back as history has been written. Spanish Merino sheep were greatly prized, and the Spanish Government forbade taking the sheep out of



Newton H. Hartman

**Sure-footed when Just Two Days Old**

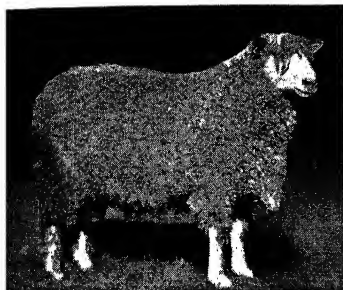
**IMPORTANT  
BREEDS**



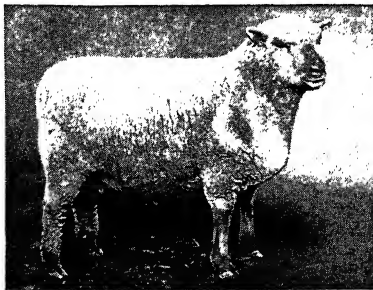
**Rambouillet Ram**



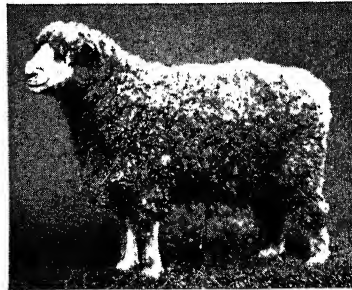
**Dorset Ram**



**Lincoln Ram**



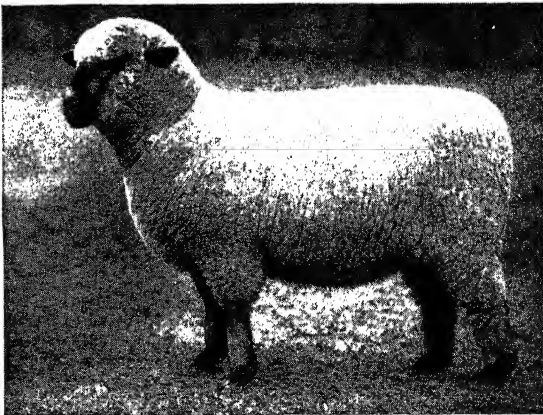
**Southdown Ram**



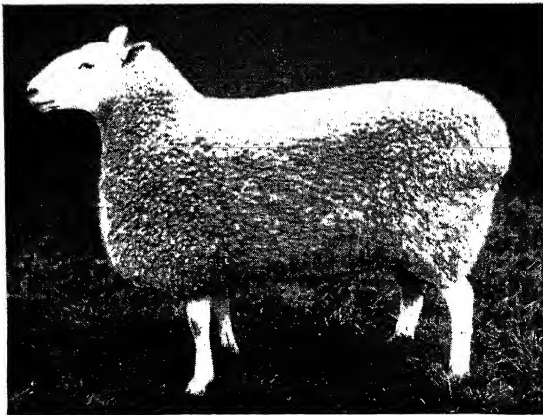
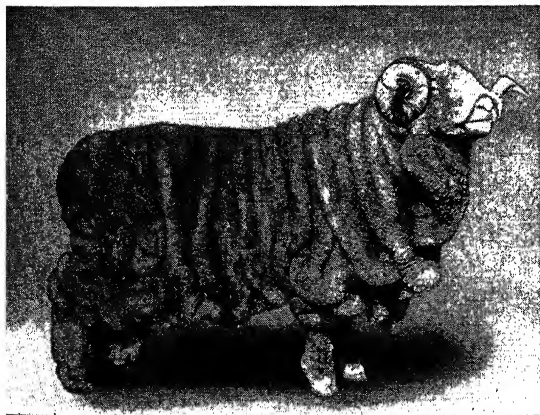
**Cotswold Ram**



**Shropshire Ram**



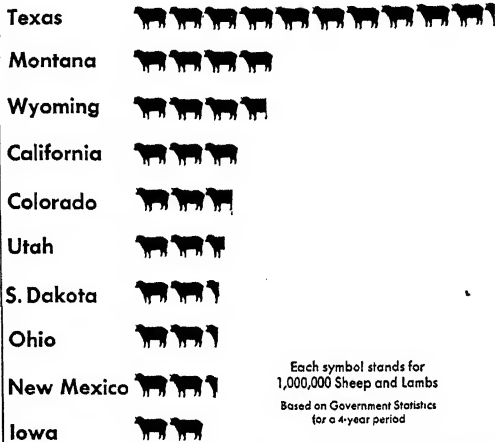
**Hampshire Ewe**



the country. Nevertheless, many sheep were smuggled from Spain into Germany, France, and England. Spaniards had improved the Merino breed very little. It was in these other countries that the Merino was developed into the modern type of sheep.

There are more sheep with Merino blood than any other breed. The original Spanish breed of Merino, however, is not so good as the improved stock that has been produced in other countries, particularly the

### Ten Leading Sheep States



United States. American Merino sheep are considered the best in the world. There are several types. All these sheep have white faces and legs, and are thickly covered with fine wool down to their toes and the very ends of their noses. The rams usually have horns.

Merinos tend to develop large folds of skin about the neck and shoulders. Some types of Merinos have body wrinkles. The *Delaine* sheep is an important type of Merino. From the wool of these sheep the woolen cloth called *delaine* is manufactured.

Large flocks of purebred Merino sheep are raised in Ohio and the surrounding states. Great numbers of sheep of mixed Merino pedigree live on the large ranches of the Western United States. Merinos are also an important breed of sheep in Australia, South America, Germany, and France.

The *Rambouillet* is another important breed which is descended from the Spanish Merino. It is named after a province in France, but it was largely developed in Germany, and later on in the United States. The breed began more than a hundred and fifty years ago. This breed is very hardy. It can thrive where there is little food. These sheep like to flock together in bands and herds. The wool of the Rambouillet is valued in the woolen mills, and it has fine meat.

**Long-Woolled Sheep.** Three of the most important long-wooled breeds come from England. They are the *Lincoln*, *Leicester*, and *Cotswold*. Lincoln sheep are popular on ranges in various parts of the world, including Australia, Argentina, and the Western United States. They are among the largest of domestic sheep, and produce the longest fleece. The Leicester sheep is es-

pecially valued by stock breeders for crossing with other sheep. It is the ancestor of most of the other long-wooled breeds of sheep. American ranchmen have also used the Cotswold in breeding quality, crossing the rams with Merino ewes. Neither Leicester nor Cotswold sheep, as such, however, are commercially important in the United States.

The crossing of two or more of the accepted domestic breeds to produce a new breed has been very common in developing modern types of sheep. Except for the Merino and Rambouillet types, probably all our modern breeds are the result of such crossing. The *Corriedale* is a cross-bred sheep which has rapidly become popular throughout Australia, South America, and the United States. In the Corriedale the breeders have attempted to combine the maximum wool and mutton production, and develop what is known as the dual purpose sheep. The Corriedale was bred from the fine wool and long wool sheep in Australia and New Zealand. The aim was to combine the wool producing qualities of the Merino sheep with the mutton producing qualities of the long wool breeds. The breeding of the Corriedale

### Ten Leading Sheep Countries



began in 1870. The breed was first imported to the United States in 1914, and is now extremely popular.

Similar crosses also have been made, which have resulted in the *Columbia*, *Romeldale*, *Thribble Cross*, and *Targhee* breeds of sheep.

**Medium-Woolled Sheep.** These sheep are grown primarily for the meat they produce, but they also are a source of wool. The most important breeds are the *Hampshire Down*, *Shropshire*, *Southdown*, and *Suffolk*. Most farmers raise these sheep as purebreds. But on the large range areas of the West, they are used for breeding with the ewes of native sheep in order to produce lambs for the market. In this area, all the lambs, the wethers (castrated males), and ewes also are sent to market for their meat.

The Shropshires are extremely popular on farms. Together with the Hampshire and Southdown, they are largely raised east of the Missouri River. The Hampshire and the Suffolk are extremely popular west of the



Missouri. These breeds came from England. The Hampshire has a black face, ears, and legs. The Southdown is a rather small sheep with a square shaped body. Shropshires are valued because they occasionally produce twin lambs. The *Dorset Horn* sheep is raised along the Atlantic Coast. It is a breed which can produce lambs at any season of the year, and therefore is valuable for producing lambs for the winter market. The Dorsets are distinct from other breeds of sheep because both the ewes and the rams have large horns. The rams' horns are extremely large and curled into a spiral. Other important medium wool breeds are the *Cheviot*, the *Columbia*, and the *Panama*.

### Raising Sheep

There are two distinctly different ways of raising sheep in the United States. The most important way is on the range. Here sheep are herded about in large bands containing one thousand to two thousand sheep. There is little equipment for housing the sheep. The herds are moved about on large tracts of land which may be owned by the sheep owner, or may be leased from another owner or from the Government. The sheep eat the grass in the pasture, and a large herd may move over many miles of range land during the grazing season.

The other important way of raising sheep is on farms. The farmer raises from thirty to a few hundred head of sheep. He keeps them in small fenced pastures and in the winter he feeds them grain and hay grown on the farm.

Throughout history, sheep have generally been raised in places that are far from cities and other thickly populated areas. There are two main reasons for this. Compared to most products, wool is very valuable in proportion to its bulk. Furthermore, it does not spoil. Therefore, it can be stored and shipped over long distances. In the second place, sheep tend to herd together, and therefore they can be handled in large bands in open country with very little labor. Sheep like to eat woods and shrubs. They can live without water for long periods of time. This makes it possible to raise sheep on the dry plains regions of the world.

In the United States, most sheep are raised west of the Mississippi. Wool sheep predominate in the West, in Ohio, and in a few other sections. Mutton sheep are raised in practically all parts of the country. The United States can produce nearly all of its needs in regard to lamb and mutton. But it imports about half of the wool it uses, because of the demand for special types of wool.

### Enemies of Sheep

Sheep are attacked by various parasites and diseases. Foot rot and sore mouth are common diseases. They suffer from internal parasites, and at one time suffered from a disease called *sheep scab* caused by mice and ticks. Large meat-eating wild animals are

still found in parts of the world, and sheep are often attacked by them. Dogs sometimes develop the tendency to kill sheep. A New Zealand parrot has received a reputation as an enemy of sheep. It sinks its hook-bill into the sheep's back and eats the sheep's liver. F.S.HUL.

**Related Subjects.** The reader is also referred to:

Animal (color plate,	Foot-and-Mouth Disease
Europe and Central	Karakul Sheep
Asia [Marco Polo's	Lamb
Sheep])	Mutton
Animal Husbandry	Ranching
Bighorn	United States of America
Buckskin	(color plate, Farm
Farming and Farm Life	Scenes in the United
(color plate, Shearing	States [Sheep Grazing])
the Sheep)	Wool

### Questions

What Western states of the United States raise many sheep?

What important products and by-products do we get from sheep?

How are sheep different from goats?

Why can sheep often graze where there is not enough grass for cattle?

How long do most sheep live?

What is unusual about each of these kinds of wild sheep: (a) the argali (b) the Marco Polo sheep (c) the aoudad?

Why were sheep first tamed? How long have sheep been bred for their meat?

From what sheep did most of our fine wool sheep come?

**SHEEP, ROCKY MOUNTAIN.** See BIGHORN.

**SHEEP DOG.** Almost everywhere that sheep have been raised, a type of dog has been developed to herd and watch the sheep. The dogs turn wandering sheep back to the flock, and keep the flock together. They also defend the herd from wild animals such as wolves and wildcats.

Some of the European breeds which have been used are the *German Shepherd*, the *Scotch collie*, the *Shetland sheepdog*, which is sometimes called a *toy collie*, the *briard*, and several kinds of collies. The Hungarian sheep dog is called a *puli*. Sheep dogs were common on American farms thirty or forty years ago. Most of them were mongrels and resembled each other only because they were part collie. They were usually loyal, gentle dogs, intelligent, and courageous. S.E.M., JR.

See also COLLIE; DOG (color plate, Working Dogs).

**SHEEP LAUREL.** See KALMIA.

**SHEEP'S FESCUE.** See FESCUE.

**SHEEPSKIN.** See BUCKSKIN.

**SHEEP SORREL.** See SORREL.

**SHEEP TICK.** See TICK.

**SHEET-METAL WORKER.** AIR CONDITIONING (Vocational Opportunities).

**SHEFFIELD** (estimated population 518,200), is a city in Yorkshire, England. It lies west of London on pleasant slopes which overlook the Sheaf and Don rivers. The city has public baths, free libraries, park and technical schools, and Sheffield University was founded in 1908. Nazi bombing in World War II damaged the ancient Cathedral of Saint Peter and Saint Paul.

As early as the 1400's, the city was famous for the manufacture of cutlery. Sheffield is still known for fine

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The Sheep Tick

steel knives, razors, scissors, chisels, saws, and many other kinds of cutlery. Candlesticks and tea pots made of Sheffield plate (silver on copper) are treasured possessions throughout the world. During World War II, Sheffield's great steel foundries and mills made armor plate and weapons. F.H.H.

**SHEIK**, *sheek*, is an Arabic title which may refer either to an old and respected man or to the chief of a tribe or village. Sometimes a sheik is the leader of a religious society. Only Moslems use the title of sheik. A sheik's power depends upon his own will and character. Some sheiks influence their followers, and control the affairs of the tribe in the manner of a ruler. Other sheiks have little power or influence. During the nationalist uprising in Turkey following World War I, the Sheikh ul Islam, or grand mufti, appealed to the Turkish people to support the sultan. But his appeal had little effect.

Songs and stories have made the sheik a romantic figure, but the average sheik is often dirty and unattractive, and sometimes cruel and selfish. M.F.L.

See also ARAB (illustration).

**SHEKEL**, *SHEK el*, is an ancient term that meant a unit of weight. Later it was used to mean a gold or silver coin. The shekel was used as a weight by the Babylonians, Phoenicians, and Hebrews. The Bible often refers to the Hebrew shekel. It weighed about 253 grains, or less than half an ounce. The shekel was first used as money in the form of uncoined gold and silver. The Hebrews coined their first metal money about 139-138 B.C. The gold shekel was worth about \$10 in present-day American money and the silver shekel was worth between sixty and seventy-five cents. Half and quarter silver shekels also were coined. In modern times, *shekel* is a slang term referring to money in general. J.Cov.

**SHELDON, CHARLES MONROE** (1857-1946). See KANSAS (Arts and Crafts).

**SHELDON, EDWARD BREWSTER**. See DRAMA (Drama in the United States).

**SHELDRAKE**. See MERGANSER.

**SHELF, CONTINENTAL**. See OCEAN (Ocean Bed).

**SHELL**. Shells are the hard coverings of animals called *mollusks*. Most mollusks have a rather large shell which covers the body. In several groups, however, such as the squids, octopuses, nudibranchs, and slugs, the shell may be inside the body. There it may be very small or entirely absent.

The shell is made up largely of carbonate of lime. This substance is given off by the *mantle*, the outer covering of the soft body. The shell usually has three layers. The outer layer or *periostracum* forms the protective covering on most shells. Beneath this layer is the *prismatic* layer. The prismatic layer is made up of prisms. The color pattern of the shell usually depends upon this layer. The inner or *nacreous* layer of the shell is smooth and shining and is often called mother-of-pearl.

Shells grow in two ways. The shell is made larger by the addition of new shelly material to the outer edge of the prismatic layer. This material is given off by the thickened edge of the mantle. The entire shell is made thicker by the addition of new shelly material to the inner *nacreous* layer by the secretions from the entire sur-

face of the mantle. The mollusk continues to add to a repair its shell throughout its life.

### Types of Shells

There are five major classes of mollusks. Each class has a rather distinctive type of shell. The chitons, one of the orders of the *Amphineura*, have a shell composed of eight transverse plates which are held together by band or girdle. All other animals in this class have shells. All members of the *Amphineura* are entirely marine.

The univalves or *Gastropoda*, commonly known as snails, have a shell made of only one piece. Most gastropods have coiled shells, but the limpets have flattened cone-shaped shells. Some limpet shells are almost completely flat. Gastropod shells vary greatly in appearance. Some have very long spines. Others may be entirely smooth or covered with nodules, pits, or ribs. One group of snails that lives in the ocean even cements other shells and pieces of stone to its shell. This is a very good means of protection against their enemies. There is a great deal of difference in size among gastropods. They may vary from tiny snails less than a millimeter in length to the large conchs which may be two feet long and weigh over five pounds. Gastropods are the most widely distributed of all mollusks. They live in the depths of the sea, along the sea shore, in fresh water, and on land.

The bivalves, or *Pelecypoda*, have shells made up of two valves, or sides. Typical bivalves include oysters, clams, and scallops. This group includes the large of all shells, the *Tridacna* clam of the South Seas. Some of the *Tridacnas* may be over three feet long, two feet high, and weigh over 500 pounds. *Pelecypods* live in both salt and fresh water.

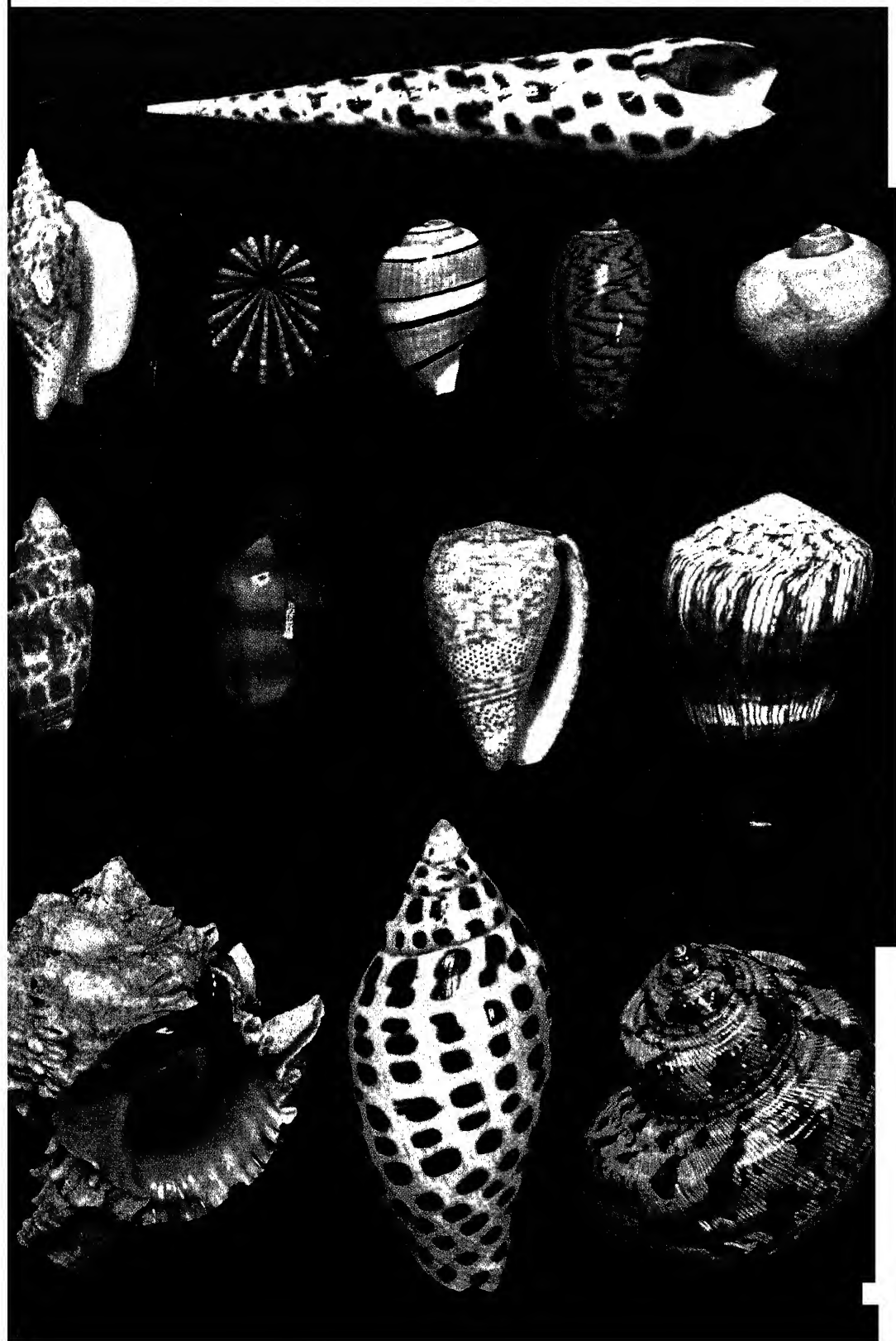
The *Scaphopoda* or tusk shells have long shells like a tube, made of only one piece, but with openings at both ends. This small specialized group is found only in the ocean.

The *Cephalopoda* includes the squid, cuttlefish, or nautilus, and Argonauta. Most of these have very small shells which are inside their bodies. The nautilus, however, builds itself a rather heavy shell in which it lives. The female Argonauta or paper nautilus builds a very beautiful, thin, fluted shell in which it stores its eggs. All Cephalopods live in the ocean.

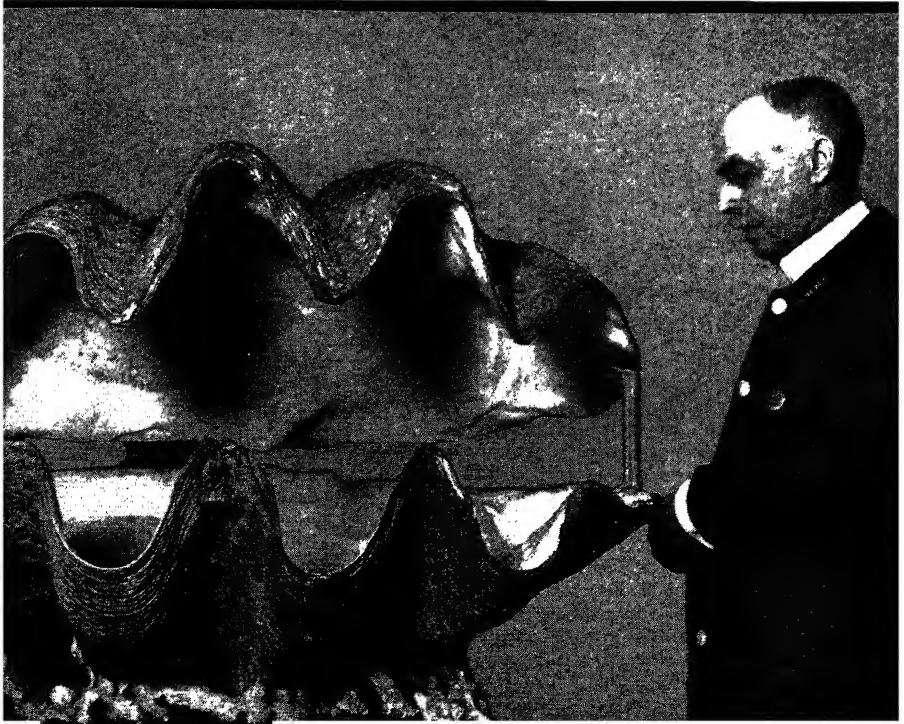
### Uses of Shells

Shells have many different uses. Sometimes they are used to make buttons and knife handles. Beautiful cameos also are carved from shells. When cameos are cut, two different shell layers are used. The outer layer is cut into a figure. The lower layer serves as a background for carving. The fresh-water mussels of the Mississippi River produce shells which are used in making pearl buttons. The inner layer of the oyster shell, called mother-of-pearl, is also used for inlaid fancy boxes, musical instruments, and wall paper. The beautiful shell of the abalone, which is green rosy-hued, also is used in decoration. Lime can be made from burned shells.

Oyster fishermen spread dead oyster shells over the floor of the ocean as places to which the newly-hatched







American Museum of Natural History

**The Shell of the Giant Clam** grows to tremendous size. The living clam often weighs more than 500 pounds when it is taken

from the coral reefs of the Indian and Pacific oceans. This giant clam shell is of the species called the bear paw.

oysters can attach themselves. Oyster shells are also used widely for building roads, particularly in the Bermuda Islands. They are soon flattened down by traffic and make an excellent highway.

There have been many unusual uses of shells. A flat, thin shell found in the Pacific and Indian oceans is so transparent that a person can read a newspaper through it. The shells are commonly used in the Philippine Islands as a substitute for glass in windows. Shells often have been used for money. In Africa and India the small cowrie shell provides a ready-made currency. The shells need only to be strung. They are the only currency of the natives of the Sudan in Africa. The wampum used as money by some of the American Indians was also made of shells.

In the Middle Ages, pilgrims wore a scallop shell on their hats to show that they had crossed the sea to the Holy Land. For this reason the scallop shells were often called *pilgrim shells*. w.j.c.

**Related Subjects.** The reader is also referred to:  
 Button Mother-of-Pearl  
 Fossil Nummulite  
 Hobby (Books about Hobbies) Shell Collecting  
 Mollusk Wampum

**SHELL.** A shell is a projectile fired from a large gun, usually a gun of more than half-inch caliber.

Modern shells range in size from the 20-mm. (20-millimeter) shell fired from aircraft and weighing less than a third of a pound, up to 16-inch projectiles fired from battleships and coastal defense guns.

High-explosive shells contain an explosive which is set off when the shell strikes the target. The most common explosive filling is TNT, or *tri-nitro-toluol*. Other fillings are amatol, which is a mixture of TNT and ammonium nitrate, and explosive D, which is used in

armor-piercing shells because it is less sensitive than TNT. Shells of solid metal, which are sometimes used to pierce armor, are called shot. Chemical shells contain smoke-producing, incendiary, or poisonous chemicals instead of an explosive charge.

**Parts of a Shell.** The typical shell is shaped like a tube, and rounded to a point in front. This part of the shell is called the *ogive*. The tail of the shell may be slightly tapered, or "boat-tailed."

The *bourellet* (boor-e-lay) is the section of the shell which touches the inside of the gun barrel. It is a narrow, smoothly-machined band near the center of gravity of the shell.

The *rotating band* is a ring of soft copper near the rear of the shell and is a little wider than the bourellet. The rifling of the gun digs into this copper band and sets the shell spinning.

Some armor-piercing shells carry a cap of tough case-hardened steel to aid penetration.

A *windshield* is mounted on some shells to cut down air resistance. This is a false nose of light metal, more sharply pointed than the shell itself.

All shells containing an explosive filling carry some sort of fuse to explode the filling. Most fuses used against ground or water targets are designed to explode on touching the target, either instantaneously or after a delay of a fraction of a second. The delay fuses are used against armored or fortified targets to give the shell time to penetrate before it explodes.

Small anti-aircraft shells carry very sensitive instantaneous impact fuses. But larger shells of this type use time fuses operated by clockwork. The time fuses are set to fire after a definite time interval which is calculated to explode the shells near the target even though they fail to make a direct hit.



One of the outstanding developments of World War II was an antiaircraft shell which exploded when it came near the target through radio-type waves rebounding from the target.

Tracer shells contain a brightly burning compound at the base of the shell, which mark the path of the shell through darkness. This enables the gunner to fire more accurately.

The thickness of a shell casing depends on the target against which it is to be directed. Shells used against troops, aircraft, and light fortifications have thin walls and the largest possible amount of explosive. Armor-piercing shells used against forts, tanks, and naval vessels have thick cases and correspondingly little or no explosive.

R.COL.

See also AMMUNITION; ARTILLERY; FRAGMENTATION; PROJECTILE; SHRAPNEL.

**SHELLAC**, *sheh LACK*, is the liquid formed of resin flakes which have been dissolved in alcohol. It is used as a varnish. The flakes are the dried form of a sticky substance called *lac resin*. When shellac is applied to a surface, the alcohol in the solution evaporates, leaving a shiny finish. Shellac resin flakes are yellow, orange, or reddish, but can be bleached white. Shellac is also used in sealing wax, insulating materials, phonograph records, polishing materials, and as a stiffener in hat making. See also LAC; LACQUER; RESIN; VARNISH. G.L.Bu.

**SHELLBARK HICKORY**. See HICKORY (illustration).

**SHELL BEAN**. See BEAN (Kinds of Beans).

**SHELL COLLECTING**. This hobby is fascinating and instructive. It is also called *conchology*, from the conch, a kind of sea shell. Some people take up this hobby merely because they are interested in the beauty and rarity of various shells. Others make shell collecting a scientific hobby, and learn much about the variety, structure, and distribution of shells.

Mollusk shells are the most popular in collections. There are three main classes of these. They are *marine*, *fresh-water*, and *land* mollusks. Since a shell is really only something like a suit of armor to the mollusk, it is easy to prepare for a collection. The mollusk is removed from the shell, and the shell is carefully dried. To prevent later cracking of these fragile shells, a thin coat of white petroleum jelly is sometimes applied. Land shells require only removal of the soft parts and washing with a soft brush. A new and interesting phase of this hobby is the making of shell jewelry such as necklaces, bracelets, and brooches.

The American Museum of Natural History in New York City has an extensive shell display in its Hall of Ocean Life.

E.S.

See also SHELL.

**SHELLEY, MARY WOLLSTONECRAFT** (1797-1851). See FRANKENSTEIN.

**SHELLEY, PERCY BYSSHE** (1792-1822), was a poet of the English Romantic Age. He has come to be numbered among the greatest of all lyric poets, although the public for which he wrote misunderstood and even despised him. The special musical quality of his verse with its delicate beauty, his soaring imagination, and his freedom-loving spirit have left a mark on the world which cannot be erased. Matthew Arnold poetically described Shelley as "a beautiful and ineffectual angel,

beating in the void his luminous wings in vain."

**The Young Rebel**. Shelley was born at Field Place, near Horsham in Sussex. His father had been made a baronet shortly before his son's birth. From his earliest years, the young Shelley showed a hatred of oppression of all kinds. This was the guiding impulse of both his earlier and later actions.

In 1810, Shelley entered Oxford University, where he soon showed his literary talents. But his publication of a pamphlet on *The Necessity of Atheism* caused the university to expel him. This event was a keen disappointment to his family. His father cut off his allowance, but later allowed him \$1,000 a year.

But Shelley eloped with Harriet Westbrook, a pretty school friend of his sisters and the daughter of a former tavern keeper. For two years Shelley and his wife trav-

eled through England and Ireland. Then Shelley left his wife and traveled in Europe with Mary Godwin. Two years later, Shelley's wife drowned herself. Shelley suffered greatly from shame and grief. But he married Mary Godwin, and went to Italy with her and their children. The courts had not permitted Shelley to keep control of his children by his first wife because of his atheistic beliefs.



**Percy Bysshe Shelley**, great English lyric poet of the Romantic Age

**Tragic Death**. In Italy

Shelley was associated with Lord Byron and with Leigh Hunt. There he produced some of his finest works. In June, 1822, he went with a friend for a sail on the Mediterranean. A storm overturned their boat, and both were drowned. The bodies were recovered, and the ashes were buried in the Protestant cemetery in Rome.

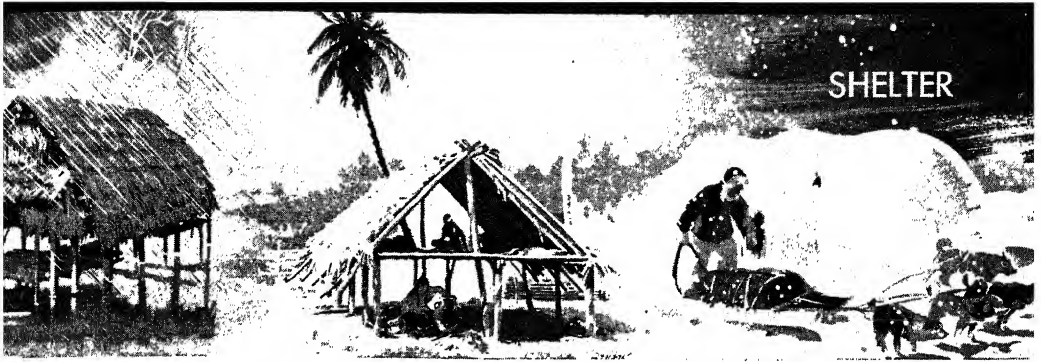
**His Writings**. From his youth, Shelley was persecuted because of his revolutionary beliefs and his independence of spirit. He longed to establish an ideal society based on the principle of brotherhood of all men, and with the aim of developing individuality instead of upholding institutions. With such ideas, Shelley naturally rebelled against the society of his time, and he tried to express his ideas in his verse. His theme in "Queen Mab," "The Revolt of Islam," and "Prometheus Unbound" is the liberation of the world. But Shelley never clearly defined his views and never offered any practical means for attaining his ends.

But his shorter lyrics are so beautiful that the reader enjoys them without bothering to puzzle out their underlying meaning. Shelley's "Ode to the West Wind," "The Cloud," "Ode to a Skylark," "Lines to an Indian Air," and the elegy "Adonais," which was written on the death of John Keats, are typical of the best verse of the Romantic period, or for that matter, in the English language. Shelley's poetry is rich in personifications, for to him nature appeared as the symbol of his own moods and emotions.

L.J.

**SHELLFISH**. See CRUSTACEAN.

**SHELL SHOCK**. See NEUROSIS.



**SHELTER** is a place for protection. It is one of man's three most important needs. The other two are food and clothing. Man has little chance of living long without shelter. The weather is one of man's worst natural enemies. He needs protection from both very hot and very cold weather, as well as from storms and wind. Wild animals and insects are man's enemies, too. He must find shelter from them in order to survive;

Nearly all land creatures seek shelter. Before man learned how to build, he found and used natural shelters, just as wild animals do. He found protection in trees, under the overhanging edges of cliffs, and in caves. The walls of some caves have pictures which were drawn many, many thousands of years ago by the men who lived in them. We know that in some places men dug holes in the ground to live in.

The first shelters built by man were very crude. Perhaps they were nothing more than branches piled together against a rock. But man slowly learned to make simple tools, first of stone and much later of metal. Tools helped him to build better shelters. He discovered and added small improvements very gradually.

Man built his shelters from whatever material he could find that best suited his needs. He used trees, bark, dried grass, animal skins, and mud. Where there were few trees, man learned to pile stones together to make a shelter. In some places, he found that he could build shelters from the earth itself. He learned how to form earthy clay into small blocks which could be dried in the sun. He built shelters from these by piling them on top of one another.

Man slowly improved his shelter as civilization developed. He was no longer satisfied with shelter which was just protection. He learned to build shelters which were also comfortable, practical, durable, and beautiful. He added plumbing and other sanitary arrangements to protect him from disease germs. Light, fresh air, pure water, heat, and other conveniences are as important as protection to modern shelters.

#### Primitive Shelters

Civilization has developed at different rates of speed in different parts of the world. We can learn much about the shelters of our early ancestors by studying those of primitive peoples who are still living. Primitive shelters are frequently round in shape. This form of shelter is found in all parts of the world. It may be shaped like a cone or a dome. Other primitive shelters are in the shape of an oblong or a horseshoe.

**North American Indian Shelters.** The shelters which the North American Indians built before the white man came are good examples of primitive shelters. For a description of these, see **INDIAN, AMERICAN.**

**Negro Huts of Africa.** Many of the Negroes of Africa

have borrowed ideas about houses from the Europeans. But some tribes still keep most of their old customs and habits. One of these is the Ba Venda tribe. They build round huts, in which only one person lives. The huts are grouped together and surrounded by a high, circular wall. The Ba Venda Negro begins his hut by digging a circular trench or ditch in the ground. Then he sets stakes three or four inches thick closely together in the trench. The stakes form the walls of the hut. He makes a roof by tying four long poles together at the top and spreading them apart at the bottom like the spokes of an umbrella. He laces thinner poles into the main poles for braces. Then he lays bundles of grass, or thatch, on top of the poles. The edge of the roof extends a few feet beyond the walls to provide shade. The walls are plastered inside and out with a mixture of puddled anthills, cow manure, and ashes.

**The People of Borneo** build huts on high posts to protect them against the rain and dampness. The posts, or piles, raise the hut several feet off the ground. The huts are large and quite long and open on a verandah. The average house can hold about forty or fifty families.

The Borneo natives also build a one-family hut. It is oblong in shape and is built on eight poles. The side walls slant outward to join the peaked roof.

**The Sakai Tribe of Malaya** build huts in the forked branches of trees because of the heavy rains. They reach their houses by bamboo ladders which they haul in at night or when they are attacked. The walls are made of thick stems, called *rattan*, and the roof of palm leaves of a kind which are from six to ten feet long. The floor is made of bamboo poles tied to the tree with *rattan*. Tree dwellers also are found in the Philippine Islands.

**The Nomads.** People who move from place to place and have no fixed home are called *nomads*. Some nomads live by hunting and are usually very primitive, or uncivilized. Other nomads have flocks, and these nomads move about in order to provide their animals with fresh grass. Such nomads are called *pastoral nomads*. They are found chiefly in Central Asia, Arabia, and to some extent in North Africa. The pastoral nomads generally are not a primitive people. Some of them are highly skilled in weaving, metalwork, and other crafts. But the type of life they lead calls for simple dwellings which can be easily built, torn down, and perhaps moved.

**The Mongolian Turt** is the typical shelter of the nomads of Central Asia. It is round and is made of a framework of poles covered with felt. The walls of the yurt are made of criss-crossed wooden poles. The roof is made of curved poles which are fastened to the top of the walls. The curved poles are joined together at the top by fitting them into a wooden ring. The ring hold is left open for smoke to escape. Many Turkish tribes of Central Asia also live in yurts.

*The Arab Nomads* of the Arabian desert generally live in tents. The tent is a framework of poles with a covering of felt stretched over it. Mats or carpets are spread on the ground inside the tent. The tents of the richer nomads are often hung with silks or fine carpets and divided by partitions of felt or carpets. They have little furniture. See ARAB; BEDOUIN.

### The History of Shelter

No one knows at just what period of time man first began to build shelters, although it must have been in the very distant past. Crude shelters of branches, bark, skins, and such material do not last very long. No evidence of them could have remained over thousands and thousands of years.

Before man learned to farm and tamed animals, he lived by hunting. Hunting people must be able to move about freely in order to follow game. Their shelters must be simple and easy to build and move. But when man learned to plant crops, he could remain longer in one place and build more permanent shelters. No one knows definitely just when or where this first occurred. Estimates range anywhere from twelve thousand to forty thousand years ago. The people who lived mostly on fish also could remain in one place as long as the supply of fish lasted. This might allow them to stay there for many years.

Man probably learned something about farming before he tamed animals. But the first farming methods must have been very simple. Perhaps man cultivated the ground with a crude hoe. After the soil was worn out, he had to find new fields. Better farming methods could not be developed until the ox had been tamed and taught to pull a plow. The manure of the animals also helped to enrich the soil. Such discoveries in agriculture made it possible for man to remain in one place longer and to develop better building methods.

The remains or traces of the earliest shelters which have been found date from the Late Stone Age, or Neolithic Period.

**Neolithic Dwellings.** The Neolithic peoples apparently built their dwellings in villages of two types, those on land and those on lakes.

**Land Villages.** A typical Neolithic land village was a cluster of huts with a high wall around it. The huts were usually round and quite small. The walls were made of stone, clay, or wood, and probably had no windows. The entrance was narrow so that it could be easily barred. Fires were built in the center of the room,

and the smoke went out through the roof. The roof itself probably was a grass thatch.

Most of these huts had only one room. Some had two, and traces of villages have been found with huts large enough to hold many families. Remains show that some huts were built in the shape of a horseshoe, a square, or an oblong.

*The Lake Villages* were dwellings built on platforms supported by piles. The piles rested on the lake bottom and were braced by heaps of stones. The houses were generally oblong in shape, and had walls of wood plastered with clay. The roof was steep and supported by a central ridgepole. Each house was usually divided into two or more rooms. The platform either extended around all sides of the house or was found only in the front of the house.

Lake dwellings were built in all parts of the world. They had the advantage of protecting the inhabitants from wild beasts or enemy tribes. They were near water, so the owners had a constant source of fish. Garbage and refuse could be dumped into the lake. Some primitive peoples today are lake dwellers.

**Egyptian Houses.** The people of ancient Egypt had already developed a fairly high form of civilization by 3000 B.C. The yearly floods of the Nile River deposited rich soil on their fields. The Egyptians were skillful farmers. But most of the people were very poor, and their homes were very simple. Only the few rich people, particularly the rulers and the nobles, could afford better houses.

The houses of the poorest Egyptians were probably only tiny mud huts covered with palm leaves. People somewhat better off had better houses. A typical citizen's house was a small square or oblong building around an open court. The building itself was divided into small cell-like rooms. The windows were small slits high in the wall to keep out the intense heat. The flat roof was supported by beams of palm trunks. A stairway on the outside of the house led to the roof, where the family slept at night. Cooking was done in the courtyard. Egyptians of all classes spent much of their time out of doors. Each house usually had its own garden. Sun-dried brick was the common building material, for all but the homes of the rich. Wood was scarce, except for that of palm trees.

The palaces and homes of the wealthy class were often very large and quite beautiful. They were usually built of stone. Many of them had rich decorations and furnishings.

The streets of Egyptian towns and cities were narrow and lined on either side by house fronts.

**Babylonian and Assyrian Homes.** Both stone and wood were scarce in the valley between the Tigris and Euphrates rivers. The common building material was brick, either dried in the sun or glazed and baked in ovens. The poorer classes lived in small, cone-shaped mud huts. The typical middle class home was oblong in shape and built around one or more open courts. The rooms were long and narrow. Some houses had two stories. Windows were small and the roofs were flat like those in Egypt. The upper story or roof was reached by a stairway on the outside of the house.

Both Babylonians and Assyrians built beautiful, large



**A Primitive Windbreak of Skins** provides scanty shelter for the Tehuelche Indians at the chilly tip of South America. These Indians move about constantly in their search for food.



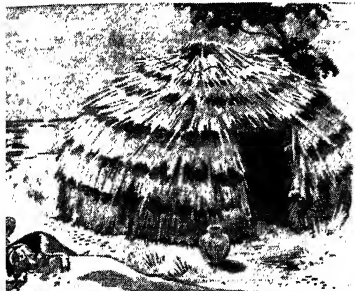
**Pueblo Indians** of the American Southwest have little rain. Their houses are of adobe brick with flat roofs.



**Fox Indians** covered the pole framework of their slant-roofed houses with bark to carry off the heavy rains.



**Modern Homes** in most parts of America have gently sloping roofs to drain the rainfall of a temperate climate.



**Shinnecock Indians** of Long Island, N.Y., used heavy thatching to keep their dome-shaped huts dry and warm.



**African Congo River Houses** are topped with steep, heavily thatched roofs to carry off the jungle downpours.



**Navaho Indians** use thick sod to absorb rain and increase the warmth of their log-walled circular hogans.

#### HOW RAINFALL INFLUENCES THE BUILDING OF HOUSES

temples and palaces. High, thick walls surrounded their cities. (See ASSYRIA; BABYLON.)

**Aegean and Greek Houses.** The Aegean peoples enjoyed a surprisingly high level of civilization. The better classes built houses of stone. Sun-dried brick was often used for poorer homes. Diggings among old villages show that Aegean towns had drainage systems and in some places fresh water was brought in through clay pipes.

A typical Cretan home was two stories high, with an inner stairway leading to the second story. It was entered through a long, narrow hallway. One side of the hall was a large living room called the *megaron*. Windows were usually large, and were probably covered with parchment. Sometimes the houses were irregular in plan and had outside stairways.

The Greeks were well supplied with building materials. They had much stone and wood, as well as clay for bricks. They were great architects and fine craftsmen, and men still marvel at the beauty of their temples. But the average Greek home was poor by our standards. The houses lay crowded together in the cities. Sanitation was almost unknown, and the people simply threw their garbage into the streets. Even wealthy Greeks built modest homes because display was not considered to be in good taste.

Greek housing probably did not reach as high a level of development as their other achievements, because the men spent so little time at home and did not care so much about improving their homes.

The private houses of Greece were oblong in shape. Most of them were only one story high, but some had two stories. Many homes had an inner court, sometimes with columns. A person entered the court through a narrow hall from a single doorway on the street side. The rooms opened on the court. The women had separate

rooms in the rear of the house or on the second story, if there was one. Windows were few and small. Charcoal burned in pans provided heat. Pictures on vases show that the Greeks had simple shower baths.

Houses of later Greek times, called the Hellenistic period, were often richly decorated, but their style changed little. Some Hellenistic cities had water mains and drainage systems.

**Roman Houses.** We know more about the kind of houses the Romans lived in than we do about those of other ancient peoples because more evidence remains. The Romans were excellent engineers. They built great aqueducts which brought plenty of water into the cities. The water was piped directly into the palaces and probably into the homes of some of the wealthy. And it could easily be obtained from public reservoirs elsewhere. They also built great sewers which drained the streets. But private houses were probably not drained directly by the sewers.

Living conditions varied considerably in ancient Rome. Some men became very wealthy and had luxurious villas. But the poorer classes lived together in dark and crowded tenements. Most of these tenements were several stories high and were poorly constructed of wood.

A common feature of the Roman private house was a central court called the *atrium*, around which the rooms were grouped. Sometimes the atrium was entirely open to the sky. But generally, the sides were roofed and the center left open. Rain water drained through this opening into a tank or basin which was located on the floor below.

Larger houses often had a second court, called the *peristylum*. This court was open to the sky and had columns around it. It often contained a fountain, statues, plants, and flowers. Some of the homes of the

wood, or stucco. The houses did not have to be as compact as those of New England, because the climate was milder. The interior always had a central hallway, often with a beautiful staircase. Fireplaces had fine mantles, often of marble. Wallpaper or fine wood panelling covered the walls.

The kitchen, spinning room, and workshops were usually in separate buildings near the main house. Some plantations had a school house where private teachers educated the owner's children. But the slaves and tenants frequently lived in crowded one- or two-room shacks. These often had no windows and only dirt floors.

*The Territory of Louisiana.* The French colonists in New Orleans built homes similar to those they had known in France. The houses lined the street and were usually close together. Balconies were common, and were often made of beautiful, lacelike wrought iron. Otherwise the buildings were of rather simple design. Sometimes a decorative iron fence enclosed the front of the house. Lovely gardens filled the courts behind the houses. Wood and plaster or brick served as the principal building materials.

*The Spanish Colonies.* The Spaniards who came to the New World usually patterned their houses after those of their homeland. The typical feature of the Spanish house is a central, open court, called a *patio*. A fountain or large basin usually stood in the center of the patio. The Spaniards who came to New Mexico used adobe, or sun-dried brick, for their houses as the Indians did. These houses were simple, one-story structures with flat roofs. A long porch often extended across the front of the building. The porch had a roof supported by posts. The fireplace sometimes occupied a corner of the room and had a hood over it.

**Shelters of the 1800's.** The citizens of the newly formed United States soon began to push their frontiers westward. The first shelters east of the Mississippi were usually log cabins. The simplest cabins had an open space on one side where a fire was built for warmth and protection. Better cabins had four snug walls and a sleeping loft reached by a ladder. The doors swung on leather hinges. Light entered through the doorway or sometimes through one or two small windows. After the settlers had the land cleared and crops planted, they had more time to build better homes.

Many of the pioneers came West in covered wagons in which they lived until they could build houses. They found little wood on the big prairies west of the Mississippi. Often they cut blocks of sod from the ground

to build simple houses. In the southwest, they used adobe.

After the discovery of gold, mining towns sprang up. The shacks, stores, and saloons of such towns were often made of bare boards.

Changes were also taking place in the East. Better transportation and new industries brought many improvements to the home. The first iron-pipe line for fresh water was laid in 1746. But satisfactory provisions for sewage disposal did not appear until much later. This created a serious problem when the water closet was invented in 1810. The sewage drained into cesspools which often overflowed and caused disease. Cities were gradually forced to lay underground sewer pipes.

The bathtub with connected pipes for hot and cold water and drainage was introduced in 1842. At first, doctors opposed its use as unhealthful. But it gained favor and became fairly common by 1860.

Gas for lighting appeared in Boston in 1822 and in New York in 1823. By 1876, it was the usual form of lighting in all cities. Farms and small towns continued to use candles and whale oil lamps until they adopted the kerosene lamp in the 1860's. Electric light was known before then, but it was not yet practical for home use.

The heating stove came into general use in the 1850's. The heating stove designed by Benjamin Franklin had been introduced in the 1740's, but few people bought it. But now the fireplace was either bricked up or used for decoration. The cellar furnace had appeared about 1830 and the radiator in 1860. By the 1870's, central heating was becoming more common.

The War between the States was followed by great industrial expansion in the North. Wealth increased. People had more money to build new homes. They forgot the simple, dignified architecture of colonial times and tried to imitate the architectural styles of Europe. They built houses which were bad copies of Gothic churches, Norman castles, Italian villas, and Swiss chalets. Architectural details from various periods were often mixed together in one house. The type of roof with a double slope all the way around the house was widely used. This is known as the *mansard* roof. Projecting windows, called *dormer* windows, were combined with it. These were often round in shape, or had rounded tops. Ceilings, windows, and doors became high and narrow, and stairways were steep.

Little domed towers, bay windows, and covered driveways, or *porte-cochères*, became popular. Sometimes a greenhouse was added. Wood trimming cut in fancy designs appeared on porches, roof tops, and railings. The interior was also over decorated.

Houses tended to become simpler in design and more liveable after the World's Fair of 1893. Builders gave more thought to convenience of arrangements. Kitchens had better equipment. Closets grew larger, and more bathrooms appeared. The front porch became a typical feature of the house.

**Shelter in the 1900's.** Shelter in the United States varies widely according to income and environment. No house can be selected as a typical American home. City families may live in apartments, crowded slums,



**To Reduce Damage from Earthquakes,** special types of houses have been developed. At the left is the low variety common on the Pacific Coast of the United States. Flimsy, light construction marks the Japanese house at the right.





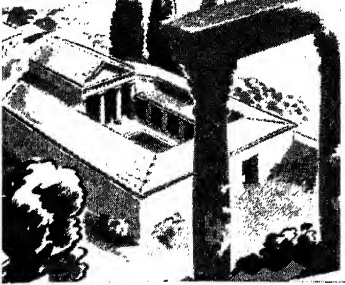
**Spacious, Roofed Verandas** sheltered entrances of old Southern homes from the sun's hot rays.



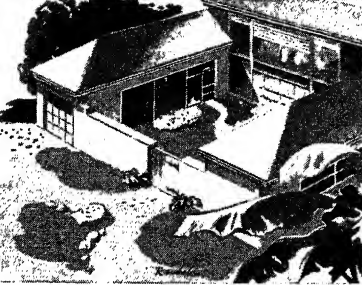
**Ironwork of Delicate Design** ornaments the shady balconies of old houses in the French Quarter of warm New Orleans.



**The Extended Roof** of a community building in the South Seas gives shade through the hot, humid days.



**Wealthy Greeks and Romans** built homes with an open central court where they enjoyed the sun's warmth.



**Many Modern Houses** are now built with an open court where a family may enjoy outdoor activities in privacy.



**The Solar House** uses the sun's rays for heating in cold weather. Such houses are light and cheerful.

#### HOW HEAT HAS INFLUENCED HOME BUILDING

or in residential sections outside of towns. Farm houses differ greatly in various sections of the country. Homes in small towns differ too, but not to such an extent as city homes.

**City Dwellings.** Land in large cities costs so much that very few people can afford to use it for gardens. Even private homes become too costly for many people in very big cities. Builders tried to solve this problem by housing many families in one large building divided into apartments. Sometimes the apartments are convenient, well ventilated, and lighted. The building owner provides janitor and elevator service, and usually heat. The rent may include the cost of gas, electricity, and telephone, or the tenant may pay for these separately. The finest apartments may be as large and as well planned as a big private home. But only well-to-do families can afford apartments of this type. A far larger number of apartments consist of only one, two, or three rooms. The kitchen is often too small for much cooking, and the occupants eat many of their meals in restaurants. Frequently, they are young married people who have no children. Both the wife and the husband may work. They may even rent the apartment already furnished. They usually do not consider it a permanent home, but only a temporary place to live until they can afford larger quarters.

Sometimes large, old dwellings are remodeled to provide a number of separate apartments. Many of these are comfortable and attractive. But often they are poorly arranged and not well kept. A whole section of the city may be made up of such remodeled apartment houses, which were once nice homes. But the residential section changed as the city grew. The original owners moved from the area, and gradually it became a slum. Other slum quarters are made up of run-down apartment houses

or tenement buildings. Slum tenements were once built to cover entire blocks. The inside rooms had no windows, and received no daylight and little air. City building codes now prevent the construction of such dwellings. But many old ones have not yet been torn down, and poor families still live in them.

With large-scale housing projects, both government and private agencies have helped to clear slum area to some extent. These housing projects usually have a number of apartment house units. Each unit is placed so that every apartment will receive sufficient light and air. Often such projects are complete communities, with well planned streets, play spaces, and shopping and recreation centers. The grounds around the buildings are usually planted with grass, trees, and flowers. All the tenants share these grounds.

Another type of apartment building contains *flats*, or *walk-up apartments*. These may have two, three, or four stories, each of which contains one apartment, or flat. The tenants must climb stairs to reach the apartments above the first floor, and therefore these buildings are often called *walk-ups*. Another name for them is row house. A whole row of such houses, one exactly like another, often occupies an entire block, or perhaps several blocks.

Cities of medium size generally have residential sections, called *suburbs*, outside the business center. Here families live in private houses. They have enough space for gardens, lawns, and trees. Suburbs of larger cities usually lie at considerable distance from the center of town. Many families with good incomes live in outlying communities, and the head of the family travels, or *commutes*, to work in the city each day.

**Suburban Homes.** The suburban house may be of any style of architecture, depending on tastes and local tra-



**Mexicans** build cool, long-lasting homes out of the clay which is plentiful in their country.



**Eskimo** take the skins of animals to cover the tents they use for homes when warm weather melts their igloos.



**Indians and Frontiersmen** built sturdy, weatherproof log cabins in the forested regions of America.

#### HOW HOME BUILDERS USE AVAILABLE MATERIALS

ditions. It is generally one or two stories high. Usually it has a basement although this may be omitted in warmer climates. The living room is the largest room in the house. The dining room may be separate or it may be combined with the living room to save space. In addition, the house has a kitchen, two or more bedrooms, and one or two bathrooms. It may also have other rooms, such as a library, a sun room, a breakfast room, or a game room. The modern house tends to have a small, well-planned kitchen. It usually contains an electric refrigerator, a gas or electric range, built-in cabinets, and sink and drainboard. The house usually has central heating provided by a coal-burning furnace or an oil or gas heater. A garage is often attached to the house or stands near by. The windows are fairly large, and the ceilings rather low. Wood, brick, stucco, stone, or concrete are the common building materials.

**Farm Dwellings.** The farmer's house may vary little from the suburban home, although it generally has a larger kitchen. A wealthy rancher or wheat grower may live in a large and very beautiful house. But the poor tenant farmer, or sharecropper, probably lives in a one- or two-room shack. His house may lack all modern conveniences. And his living standard may be even lower than that of the city slum dweller, except that he does have fresh air. Probably the majority of farm homes lie somewhere between these two extremes. They are usually comfortable structures of two or three stories, generally built of wood. An increasing number of farm homes are being provided with bathrooms and electricity.

#### Shelter in Asia

Climate, living conditions, and native customs all influence the type of shelter that is built. And Asia is so large that many different kinds of shelter can be found there.

**Chinese Homes.** China has no large forest areas and therefore wood is little used to build houses. The common building materials are brick, tile, adobe, and bamboo, depending on the region and the wealth of the owner.

The rivers of Southern China are filled with houseboats. Entire families live on these boats all the year round. Most of these boats are fairly small, and the shelter on deck may consist of nothing more than straw matting.

The average house of a middle-class Chinese family often has only three rooms. The central room serves as a living room, reception room, and dining room. The rooms opening off each side of the central room are used

as bedrooms. The kitchen may be in a separate building. A verandah sometimes extends across the front of the house. Roofs are commonly of tile, either glazed or unglazed. The tiles vary in color from city to city. The roof usually turns up at the corners. More rooms may be added if a son marries or the family increases its wealth. A wall usually surrounds the house, and a small wall stands behind the entrance gate. The purpose of this wall is to prevent the entrance of spirits, according to the Chinese. They believe that a spirit cannot go around a corner.

The interior of the house may have simple but beautiful furnishings. The floor is probably of wood or tile, or in poorer homes of dirt. Windows are almost always covered with paper. Few Chinese have bathrooms, and their sanitary practices are not high by our standards. Even the homes of the rich are seldom well heated or ventilated.

**Japanese Homes.** The Japanese home differs from all other houses in the world in that the rooms are seldom divided by permanent walls. Instead, sliding screens made of wood frames covered with paper are used. The screens fit into grooves in the floor and ceiling and can be arranged in a number of different ways. The use of paper screens leads many people to believe that Japanese homes are very flimsily constructed. But the Japanese carpenter builds a substantial and carefully fitted frame for the house. The frame nearly always is of wood, which is fairly plentiful. The Japanese prefer to leave the wood unpainted. The outer walls may be of wood, slate, tile, or plaster, and the rear wall may be of paper screens. A verandah nearly always stretches across the side or the rear of the house. Shingles, tile, or thatch cover the roof, which is of moderate slope. Windows are paper covered. Both windows and doors slide open side-ways.

Japanese homes have no basements. The supporting posts of the house rest on boulders, to which they are carefully fitted. Many city houses have two stories, but stairways are not common. The second story is reached by a stepladder. Both rich and poor people follow the same general plan of home construction. But the houses vary considerably in size, according to the wealth of the owner. Almost every house has a private garden except in the crowded and poorer sections of the cities.

Furnishings are few and simple but artistically arranged even in poorer homes. The standard floor covering is woven grass mats. The Japanese have no beds. They spread quilts on the mats to sleep on. All but the poorer houses have bathrooms. The Japanese bathtub is a large wooden tank lined with copper and divided

into two sections. A firebox heats the water in one section. The water circulates through openings in the partition to the other section where the bather sits on a wooden seat. Kitchens have no chimneys or ceilings. The smoke finds its way out through the rafters.

Many Japanese in the cities have built homes like those in Europe or the United States.

**Homes of India.** Hindu building methods are very old. The social system of India orders that houses shall be erected by the caste of builders. The builders worked out certain rules for construction by about A.D. 500, and they have followed these rules fairly closely ever since that time.

Many Hindus are farmers who live in small villages. Very few ever have more than the simple necessities of life, and often not even that much. Their homes are very plain. A typical home is a group of oblong huts placed corner to corner around a court. Each hut measures about twenty feet long and fifteen feet wide, and has only one story. The front hut has a doorway leading to the street. Sometimes a platform or small porch runs along the front. This hut serves as a living room and reception room. The women and children live in the opposite hut. The hut on one side shelters the cattle, and the one on the other side is used as a kitchen.

The walls are about two feet thick, and are made of clay. Most houses have no windows. If there are windows, they are small and high and covered with lattice to keep out monkeys. Roofs are thatched. Floors are of hard clay. The houses lack any sanitary conveniences. But most of them are quite clean, although the streets are filthy.

The houses of the Himalaya mountain regions have

no central court. Instead, they are usually two stories high and have a verandah on the second floor. The family keeps the cattle on the first floor and lives on the second.

The Hindu who lives in the city likes a brick house with a tiled roof. It usually has two or sometimes three stories. The architecture of town houses may not be purely Indian, but is likely to be influenced by European styles. Some of the houses in certain sections have beautifully carved wooden balconies, doors, and window frames.

#### Modern Ideas about Shelter

More and more, houses are being planned from the inside out. The rooms and living spaces are planned first because they are the most important parts of the house. The outside is then planned around the inner space. The traditional house is planned in the opposite way. The style for the outside is chosen and the rooms are made to fit into this plan.

Modern houses have very little decoration. They depend on shape and form for their beauty. Most of them have flat roofs and large window spaces, especially on the sunny side. A wide overhanging roof protects the house from the heat of the sun in summer. But it lets in the winter sunshine. The warmth of the sun through the glass produces partly enough heat for the house. This results in lower fuel bills. Such heat is called *solar heat*. A house designed to use solar heat is called a *solar house*. Comparatively few of our modern houses are solar houses.

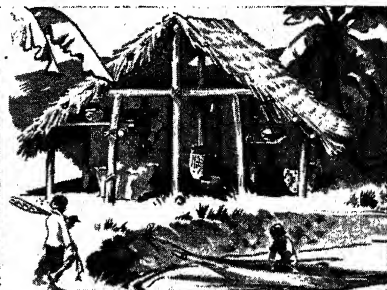
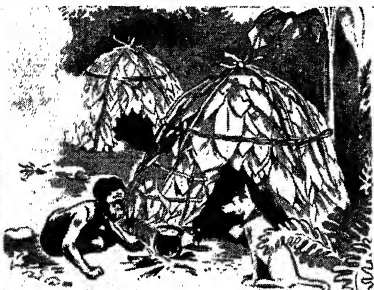
Most modern houses are long and low. But their rooms are not always oblong or square. They may be of

#### HOW CLIMATE INFLUENCES TROPICAL HOME BUILDERS

**Borneo Headhunters** build their houses on stilts to protect their floors from the always damp earth.

**African Pygmies** use broad leaves to shed the quick but short-lasting jungle rains from their beehive huts.

**Peruvian Indians** live in open-walled huts to get the most possible ventilation in their sticky climate.

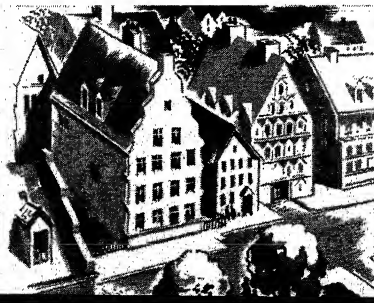


#### HOW SNOW AFFECTS NORTHERN HOME BUILDERS

**Swiss Chalets** are protected from the deep snows of the fierce Alpine winters by wide, overhanging eaves.

**In Northern Germany,** steep roofs quickly shed the heavy snowfall of the long winter. The houses are often built of stone.

**Houses in Arctic Siberia** have a funnel-like platform to protect the smoke hole from drifting snow.



any size or shape. A screen or sliding partition sometimes divides the rooms instead of walls. Several rooms can thus be made into one large room. Terraces form part of the living section and are treated as outdoor rooms.

Glass brick, double layers of insulating glass, metals, and plastics are used in modern houses as well as more common materials.

Some designers of houses have thought of them as "dwelling machines." These architects often use novel means to provide more comfort and convenience. One unusual type of house is round and built around a central mast. The center core contains all the plumbing and wiring connections. The house itself is made of lightweight metal. The rooms are shaped like pieces of pie and divided by sliding or folding screens. A factory builds this house in sections, and these can be taken to the house site and erected in a short time.

The process of building houses in sections which can be quickly fitted together is called *prefabrication*. Any style of house can be prefabricated. Prefabrication is faster and in many ways better than the building of each part by hand. Prefabrication has increased in general use since the early 1930's.

Shelter has advanced a long way from the cave to the comfortable, attractive home of today. Modern shelters must provide more than mere protection. They must supply comfort and satisfaction. They must be places in which to play and work as well as eat and sleep. They are planned so that work can be accomplished without wasted effort and in the least possible amount of time. Man now knows how to build homes which provide good living as well as shelter.

H.MAR.

**Related Subjects.** The reader is referred to sections in the articles on continents and countries, such as AFRICA (Life of the People [Shelter]), and to the following articles:

Castle	Hogan
Cave Dweller	Housing (with list)
Climate (illustration,	Lake Dwelling
How Climate Affects	Log Cabin
Our Lives)	Pioneer Life (Pioneer
Colonial Life in America	Homes)
(Home Life and	Sod House
Customs)	Tent
Eskimo (Eskimo Homes)	Tepee
Furniture	Wigwam

#### Books for Youngest Readers

- BONE, STEPHEN, and ADSHEAD, MARY. *The Little Boy and His House*. Winston, 1937. How a boy travels around the world to learn about houses of other lands.
- BURTON, VIRGINIA LEE. *Little House*. Houghton, 1942. A house in the country finds itself surrounded by the city.
- HADER, BERTA and ELMER. *The Little Stone House*. Macmillan, 1944. The Doe family builds its own house.

#### Books for Younger Readers

- LAMPREY, LOUISE. *All the Ways of Building*. Macmillan, 1944. Experiences in building from caves to modern skyscrapers.
- PEET, CREIGHTON. *This is the Way We Build a House*. Holt, 1940. Billy and his brother watch every step as their new home is built.
- PETERSHAM, MAUD FULLER and MISKA. *Story Book of Houses*. Winston, 1933. Beautiful illustrations of houses here and everywhere.

ROBINSON, ETHEL FAY and T.P. *Houses in* Viking, 1936. Well-illustrated history of old houses in our country.

For books for older readers, see the Bibliographies in the articles ARCHITECTURE and HOME ECONOMICS.

#### Outline

- I. Definition of Shelter
- II. Primitive Shelters
  - A. North American Indian shelters
  - B. Negro huts of Africa
  - C. The people of Borneo
  - D. The Sakai tribe of Malaya
  - E. The Nomads
    1. The Mongolian yurt
    2. The Arab nomads
- III. The History of Shelter
  - A. Neolithic dwellings
    1. Land villages
    2. Lake villages
  - B. Egyptian houses
  - C. Babylonian and Assyrian homes
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  - E. Roman houses
    1. Heating and lighting
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  - H. The Industrial Revolution
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    3. Territory of Louisiana
    4. The Spanish colonies
  - B. Shelters of the 1800's
  - C. Shelter in the 1900's
    1. City dwellings
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    3. Farm dwellings
- V. Shelter in Asia
  - A. Chinese homes
  - B. Japanese houses
  - C. Homes of India
- VI. Modern Ideas about Shelter

#### Questions

- What early people had shower baths?
- Why was garbage disposal easy for the Lake Dwellers?
- How did the ancient Greeks dispose of their garbage?
- In what ancient country was a central heating system used?
- Which people were the first to use glass window panes?
- Where does the word *window* come from?
- When did fireplaces become common?
- What very early people had drainage systems and piped fresh water into their homes? When was water first piped into the homes of London?
- How did the discovery of agriculture change man's ideas of shelter?
- When was gas first used for lighting? When did the cellar furnace appear?

**SHELTER BELT.** A shelter belt is a line of trees or shrubs which are planted to protect the soil of a region from wind and erosion. The Shelter Belt Project, which later became the Prairie States Forestry Project, was created by the United States Government in 1934. The project was set up under the direction of the Forest Service to develop wind barriers on farms in the plains states which had suffered from erosion and dust storms. When the project was discontinued in 1942, a belt of 222,825,220 trees had been planted on 33,185 farms in North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and northern Texas.

C.D.D.

**SHEM**, the eldest son of Noah. See **NOAH**.

**SHENANDOAH**, *SHEN an DOH ah*. See **DIRIGIBLE** (Dirigibles in the United States).

**SHENANDOAH CAVERNS**. See **VIRGINIA** (Caverns and Springs).

**SHENANDOAH NATIONAL PARK** lies in the heart of the Blue Ridge Mountains of Virginia. It was created in 1935. The park covers 302.30 square miles, most of which is wilderness. Nearly all the land in the park is at least 2,000 feet above sea level. There are about 60 mountain peaks in the park. They are magnificently shaped, and covered with hardwood trees. The highest mountain in the park is Hawksbill (4,049 feet).

The Skyline Drive is a highway which runs 97 miles through the length of the park, and along the crest of the Blue Ridge Mountains. Many breath-taking scenes are unfolded along this winding road, and trails lead off from the drive into the mountain wilderness.

Many kinds of wild flowers grow in the park, including azaleas, mountain laurel, hawthorn, and dogwood. Wildlife includes red and gray foxes, squirrels, opossums, skunks, minks, weasels, and groundhogs. In the fall, the mountains are splashed with color. Shenandoah Park is rich in history. George Washington passed through the area during the French and Indian Wars. Battlefields of the War between the States lie on both sides of the Blue Ridge Mountains. H.E.

**SHENANDOAH RIVER** rises in Augusta County, Virginia, and flows northeast for 170 miles through a beautiful valley between the Blue Ridge and central Appalachian Mountains. The Shenandoah joins the Potomac River at Harper's Ferry, W. Va. Small steamers can use the river for 100 miles of its course. The Shenandoah furnishes electric power to the surrounding country. The Shenandoah Valley was an important battle area during the War between the States. L.D., JR.

**SHEPARD, HELEN MILLER GOULD**. See **GOULD**.

**SHEPHERD DOG**. See **DOG** (Usefulness of the Dog).

**SHEPHERD KINGS**. See **HYKSOS**.

**SHEPHERD LIFE**. See **ARAB**; **BEDOUIN**; **GREECE** (Agriculture); **INDIAN, AMERICAN** (Nomads of the Southwest); **IRAN** (Way of Life); **NOMAD**; **SHEEP**.

**SHERATON**, *SHER ah tahn*, **THOMAS** (1751-1806), was the last of the great English furniture designers of the 1700's. A highly developed sense of proportion was combined with an elegance and originality of treatment in his pieces. His furniture was severely simple in form but light and perfectly balanced with decorative details.

Sheraton was born at Stockton-on-Tees, and came to London about 1790 as a journeyman cabinetmaker. He never had a shop of his own. Besides his trade as furniture maker, he was an author, publisher, bookseller, teacher of drawing, and preacher. He died a very poor man. E.C.A.

See also **FURNITURE** (Sheraton).

**SHERBROOKE**, Quebec (population 35,965), is the trading center of a rich agricultural and industrial region. The city lies at the meeting point of the Saint Francis and Magog rivers. Sherbrooke is about 96 miles east of Montreal and about 30 miles north of the United States boundary. Sherbrooke factories make clothing, silk and artificial silk products, machinery tools, rubber goods, jewels, boats, and iron and steel products. The

first settler was Gilbert Hyatt who built a homestead here in 1796. Until a visit of the Governor-General, Lord Sherbrooke, in 1818, the settlement was known as Hyatt's Mills. Sherbrooke was incorporated as a town in 1852 and as a city in 1875. J.A.D.

**SHERIDAN**, Wyo. (population 10,529). Many people wear cowboy boots and "ten gallon" hats on the streets of this modern city, and give it the atmosphere of the Old West. Sheridan is the largest city in northern Wyoming. It lies in the fertile Sheridan Valley, about fifteen miles east of the Big Horn Mountains. The city is an important railway center. It ships the products of the cattle and sheep ranches and the large farms in the irrigated valley. There are several dude ranches in the region. Crow and Cheyenne Indians often come to Sheridan from their near-by reservations. Sheridan received a city charter in 1883. T.A.L.

**SHERIDAN, PHILIP HENRY** (1831-1888), was a Union officer in the War between the States. He was noted for his great courage and brilliant leadership. His military career was an almost unbroken series of victories. "Little Phil," as he was called because of his small size, was one of the three Union officers in the war who reached the rank of general. The other two were Ulysses S. Grant and William T. Sherman.

Sheridan was born in Albany, N.Y., the son of Irish immigrants to the United States. He was graduated from the United States Military Academy in 1853 and served for a while in wars against the Indians. When the War between the States broke out, he was only a lieutenant, but he fought so well at Boonville, Mo., that he was appointed a brigadier general. In December, 1862, he was raised to the rank of major general.

In the fall of 1863 Sheridan's division fought so well at the Battle of Chattanooga that Grant made Sheridan commander of cavalry in the Army of the Potomac. Sheridan took command in April, 1864, and protected the flanks of Grant's army. He continually attacked Confederate communications around Richmond and made many daring raids against the Confederate lines. In August he was given command of the Army of the Shenandoah with orders to push the enemy south and also to destroy all supplies in the Shenandoah Valley.

The Confederate general, Jubal Early, held a strong position in the Valley, but Sheridan proceeded against him and defeated him at Opequon Creek, Fisher's Hill, and Cedar Creek. Sheridan's army was surprised by General Early at Cedar Creek, and was almost defeated. Sheridan was at Winchester, twenty miles away, when the battle began. He heard the sounds of battle and made his famous ride to the battlefield to turn defeat into victory. Thomas Buchanan Read's poem, "Sheridan's Ride," tells of this stirring episode.

Sheridan's defeats of Early in the Shenandoah Valley and his destruction of livestock and crops in this fertile



Brown Bros.

**Philip Sheridan**, cavalry hero of the Union Army



region are considered among the great blows that hastened the fall of the Confederacy. These exploits brought Sheridan the rank of major general in the regular army. During the rest of the war he was one of Grant's most efficient aides and helped force the surrender of Robert E. Lee at Appomattox.

After the war, Sheridan commanded in turn the Department of the Gulf, the Fifth Military District in Louisiana and Texas, and the Department of the Missouri. He was appointed lieutenant general in 1869, and the next year went to Europe to study operations in the Franco-Prussian War. In 1884 Sheridan was appointed commanding general of the United States Army, and four years later was made a general. F.A.S.

See also FORT SHERIDAN.

**SHERIDAN, RICHARD BRINSLEY** (1751-1816), wrote the classic comedies *The Rivals* and *The School for Scandal*. These plays rank among the best comedies written in England since the time of William Shakespeare. Sheridan's genius lay in his gift for satirical characterization and witty dialogue.

Sheridan was born in Dublin, Ireland, and studied law before he took up writing as a profession. In 1775 *The Rivals* was successfully produced in London. The same year, his comic opera, *The Duenna*, played for seventy-five nights, which was an unusual run at that time. With others Sheridan bought the Drury Lane Theater, and managed it until it burned in 1809. This disaster cut off the greater part of his income, and during the rest of his life he was in serious financial difficulties. At one time his friends raised money to obtain his release from a debtors' prison.

Sheridan was popular among the literary men of his time because of his wit and charming personality. He belonged to Samuel Johnson's famous Literary Club. He also was for thirty years a member of Parliament and became famed as a debater and orator. B.M.

His Works include a farce, *Saint Patrick's Day*, and a comedy, *The Critic*.

**SHERIFF**, in the United States, is one of the chief administrative officers of a county. It is his duty to take charge of prisoners, to oversee juries, and to prevent breaches of the peace. He also carries out the judgments of the county court. For example, if the court gives a judgment against a debtor, the sheriff seizes his property and sells it to satisfy the claims of creditors. The sheriff may perform these duties himself, or he may give other persons the power to act in his name. These persons are called *deputy sheriffs*. In most states the voters of the county elect the sheriff. In Canada sheriffs are not elected but appointed.

The word *sheriff* comes from old England. Each *shire*, or county, had a headman known as a *reeve*. The title *shire reeve* gradually became the single word *sheriff*. H.F.A.

See also LAW ENFORCEMENT; SHIRE.



Brown Bros.  
**Richard Sheridan**, British statesman and playwright

**SHERMAN, JAMES SCHOOLCRAFT** (1855-1912), was Vice-President of the United States from 1909 until his death. From 1887 to 1891 and from 1893 to 1903 he was a representative in Congress from New York.

**SHERMAN, JOHN** (1823-1900), was an American statesman. He is noted for introducing the silver and anti-trust laws that bear his name. (See TRUST [Trust Legislation].) Sherman was born in Lancaster, Ohio, the younger brother of the famous Union general William T. Sherman. He was elected to the House of Representatives in 1854, and seven years later was elected to the Senate. Sherman served for a time as Secretary of the Treasury under President Rutherford B. Hayes, and then returned to the Senate. His last public office was as Secretary of State under President William McKinley. E.E.R.O.

**SHERMAN, ROGER** (1721-1793), was an early American statesman. He took an important part in the writing of the Declaration of Independence and the Articles of Confederation, and also in the ratification of the United States Constitution.

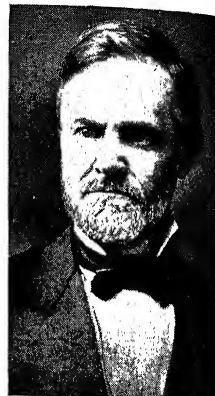
Sherman was born in Newton, Mass., but during his long public career was a citizen of Connecticut. When the first United States Congress met in 1791 he represented Connecticut in the House of Representatives. Later in the year, he was named senator. Sherman remained in this office until his death.

See also STATUARY HALL.

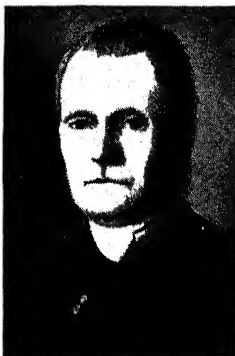
**SHERMAN, WILLIAM TECUMSEH** (1820-1891), was one of the greatest Union generals of the War between the States. He is best remembered for his march from Atlanta to the sea. By

this march he brought the war home to the civilian population of the South. Sherman has been called the first modern general because he made this march for the purpose of destroying supplies rather than lives. This idea that a war can be ended sooner by destroying the materials of war rather than by killing soldiers is one of the basic principles of modern warfare. Sherman hated war and is said to have summed up his feelings in the famous phrase, "War is hell."

Sherman was born in Lancaster, Ohio, the brother of the statesman, John Sherman. His father died when the boy was very young and he was brought up by Thomas Ewing, the first Secretary of the Interior. Sherman was graduated from the United States Military

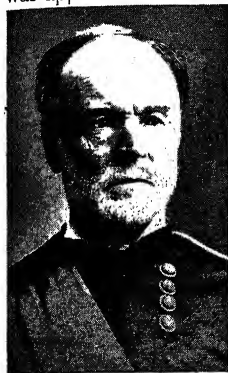


Brown Bros.  
**John Sherman**, American lawmaker who wrote the Sherman Anti-Trust Act



CU  
**Roger Sherman** was an American Revolutionary leader in Connecticut.

Academy in 1840 near the head of his class. He was given the rank of second lieutenant of artillery and for the next few years fought against the Seminole Indians in the South. Sherman was ambitious, and in his spare moments he studied law. During the Mexican War, he was appointed assistant adjutant general in California



Brown Bros.

**William Tecumseh Sherman** was one of the most successful of Union generals.

because of his legal knowledge.

In 1853 he retired to civilian life and became a banker in San Francisco. Sherman was not very successful at banking and began the practice of law. He lost the only case he ever tried. Sherman longed to rejoin the army, but all his efforts were in vain. For a time he was superintendent of a military academy in Louisiana, and afterward was president of a St. Louis, Mo., street railway company. But in each position he was a failure.

Finally, when the war broke out, he rejoined the army and soon became a brigadier general of volunteers. He was given charge of the Department of Kentucky, but he was relieved because he asked for more troops to defend the state. In April, 1862, he impressed General Ulysses S. Grant by his excellent assistance at the Battle of Shiloh and was appointed major general of volunteers. Sherman continued to work with Grant, and after the victory at Vicksburg, he was made brigadier general in the regular army. After further valuable service in Tennessee and Mississippi, he was given command of the Military Division of the Mississippi.

In the spring of 1864 Sherman began the invasion of Georgia. Atlanta was taken on September 1. Then followed the march to the sea. It ended on December 21 with the capture of Savannah. Early in 1865, Sherman started northward and worked his way through South and North Carolina. On April 26 he received the surrender of Joseph E. Johnston's army.

In 1866 Sherman was given the rank of lieutenant general. Three years later he was given command of the United States Army with the rank of general. Sherman held this rank for fourteen years and then retired at his own request.

F.A.S.

**SHERMAN ANTI-TRUST ACT.** See EDMUNDS, GEORGE FRANKLIN; HARRISON, BENJAMIN (Domestic Affairs); TRUST (Trust, Legislation).

**SHERMAN SILVER PURCHASE ACT.** See CLEVELAND, GROVER (Second Administration); HARRISON, BENJAMIN (Domestic Affairs).

**SHERMAN.** See WINE.

**SHERWOOD, ROBERT EMMET** (1896- ), is a successful American playwright. He won the Pulitzer prize for drama three times. The prize was given in 1936 for *Idiot's Delight*, in 1939 for *Abe Lincoln in Illinois*, and in 1941 for *There Shall Be No Night*. Many of Sherwood's plays set forth his political and philosophical beliefs, but with such high dramatic skill that they do not seem to preach.

Sherwood was born in New Rochelle, N.Y. He attended Harvard University, but left to join the Canadian Expeditionary Force in World War I. After the war he became a magazine editor.

See also PULITZER PRIZES.

E.L.C.

**His Works** include *The Road to Rome*; *Reunion in Vienna*; *The Petrified Forest*; and *The Rugged Path*. He also wrote the novel *The Virtuous Knight*.

**SHERWOOD FOREST.** See ROBIN HOOD.

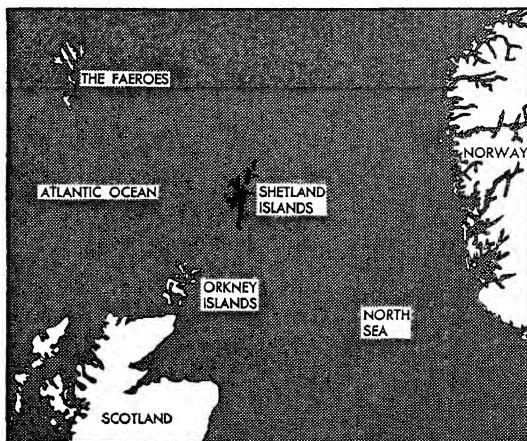
**SHETLAND ISLANDS.** This island group lies between the Atlantic Ocean and the North Sea. The Shetland Islands are Great Britain's most northerly possession in Europe. They are about 50 miles northeast of Scotland's Orkney Islands, and 210 miles west of Norway. The Shetland Islands make up a county of Scotland.

About a hundred islands make up the Shetland group, but people live on fewer than thirty of them. Some islands have only lighthouse keepers and a few shepherds. The islands cover an area of about 550 square miles, and have an estimated population of 19,700. These people are of Scandinavian origin and their language still contains many Icelandic words. Mainland is the largest island of the group. The county seat, Lerwick, is situated on Mainland.

The Shetland Islands have a wild, colorful beauty. Their rugged coasts rise from the ocean in deeply cut cliffs. Lonely lighthouses stand on hills which overlook the sea. Many tourists visit the islands during the summer season.

The islands are the home of the famous small, shaggy Shetland ponies, and of an unusually small breed of cattle. Shetland sheep produce long, fine wool which is in demand throughout the British Isles to supply the various knitting and weaving industries.

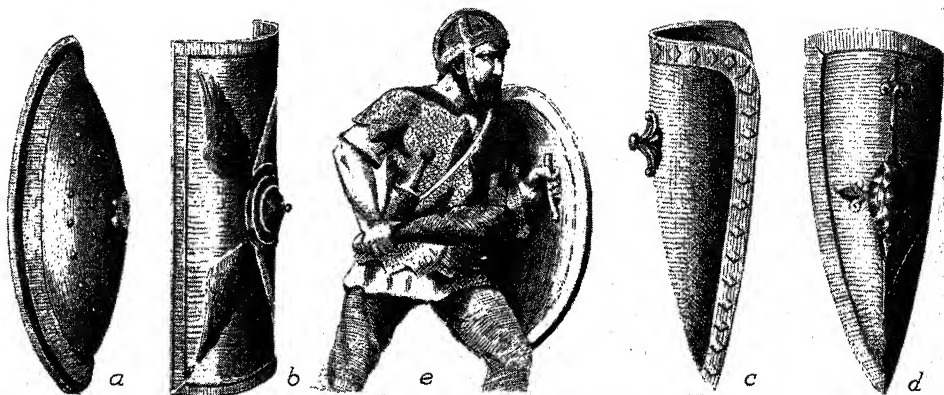
The main occupations of the Shetland people are fishing, and raising cattle, sheep, and ponies. There once was considerable whale hunting off the Shetland Islands. Lerwick was the last port for Arctic whalers. Many of the whale hunters were Shetlanders. This is one reason why many good sailors still come from the Shetland



Location Map of the Shetland Islands

Islands. Farmers raise oats, barley, and vegetables. Knitting the fine wool into hosiery and shawls is an important home industry.

E.E.E.



**Shields of Ancient and Medieval Times.** They are: (a) Roman; (b) Greek; (c) shield of William the Conqueror (about

1066); (d) shield of an English Crusader during the Third Crusade (1189-1191); (e) one way of holding the shield.

**SHETLAND PONY.** See HORSE (Types and Breeds of Horses [Ponies]); SHETLAND ISLANDS.

**SHEYENNE, *SHI EN*, RIVER.** See NORTH DAKOTA (Rivers and Lakes).

**SHIAH, *SHE ah*, or SHIITE, *SHE ite*.** See ISLAM (Sects).

**SHIELD, *sheeld*.** The shield was the chief means of protection in war from earliest times until the invention of firearms. Shields of wood, sometimes covered with animal hide, could be held in one hand to ward off blows of an enemy, while the other hand was free to use a club, sword, or spear. Later, metal shields were used.

Shields were of many sizes and shapes. The shields of Greek soldiers were long and heavy, and covered almost the entire body. The round shields of the Romans were much lighter and smaller than those of the Greeks.

During the Middle Ages, the shield was an important part of the equipment of both armored knights and common foot soldiers. If the shield was to be held at

arm's length, it was called a *buckler*. If it was to be fastened to the arm, and was held across the body in combat, the shield was called a *target*. The knights of the Middle Ages decorated their shields with their coats of arms so that they could be recognized even when in full armor.

Many native tribes still carry shields to war or as a protection while hunting wild animals. These shields are usually made of wood covered with oxhide.

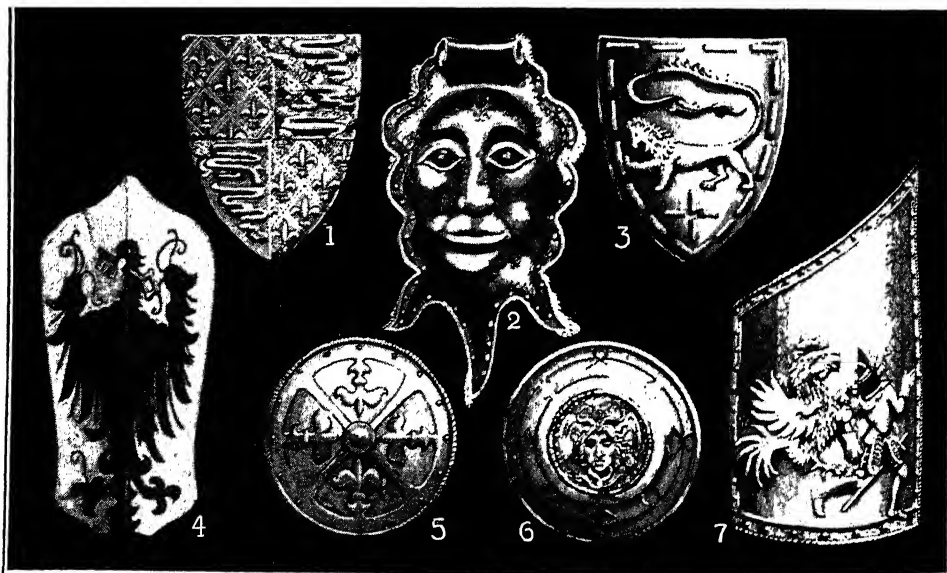
The term *shield* still has significance in naval warfare. It is applied to the covering of armor plate installed around a gun turret.

R.Co.

See also ARMOR.

**SHIELD FERN.** See FERN (Classification).

**SHIELDS, JAMES** (1806?-1879), was a Union Army officer in the War between the States. He was born in County Tyrone, North Ireland, and came to the United States at the age of twenty. Shields practiced law for a



**Some Famous Shields:** (1) shield of the Black Prince, son of Edward III of England; (2) grotesque shield of Charles V of Spain; (3) typical shield of the Crusaders; (4) canvas-covered

shield of medieval Germany; (5) type of shield used in many parts of Europe during the 1500's; (6) Spanish shield, bearing Medusa head; (7) shield of Francis I of France.

while, and was a brigadier general in the Mexican War. In 1848 he was appointed governor of the Oregon Territory. Afterward he served in turn as United States Senator from Illinois, Minnesota, and Missouri. See also STATUARY HALL. W.B.H.

**SHIITE**, *SHE* ite, or **SHIAH**. See ISLAM (Sects).

**SHILLABER**, *SHIL* ay ber, **BENJAMIN PENHALLOW** (1814-1890), was an American humorist. He became popular for his homely bits of wisdom, which he wrote under the pen name of Mrs. Partington. He was born at Portsmouth, N.H. In 1847 the sayings of the imaginary Mrs. Partington began to appear in the *Boston Post*. In 1851 Shillaber started a humorous weekly, the *Carpet-Bag*. It was the first publication to carry the writings of Mark Twain and Artemus Ward. G.M.E.

His Works include *Life and Sayings of Mrs. Partington* and *Rhymes With Reason and Without*.

**SHILLING** is a silver coin in the English money system. It is equal to twelve pence, and has a value of one twentieth of an English pound sterling. It is normally worth about twenty-four cents in United States money.



Case Bank Collection of Moneys of the World

Face and Reverse Side of a Shilling of 1723

Shillings were used in America in colonial days. See also PINE-TREE SHILLING. J.CoF.

**SHILOH**, *SHI* loh, **BATTLE OF**. See WAR BETWEEN THE STATES (Principal Battles).

**SHIMMY**. See DANCING (Development of the Dance).

**SHIMONOSEKI**. See JAPAN (Cities).

**SHIMONOSEKI, TREATY OF**. See CHINESE-JAPANESE WARS.

**SHINGLES** are blisters on the skin caused by an ailment called *herpes* or *herpes zoster*. The blisters usually follow the path of a sensory nerve, and the ailment is as much a nervous disease as it is a skin disease.

Just before the blisters appear there is usually an attack of pain in the area about to be blistered. Sometimes the first blisters last for only a week or so and disappear, followed by a feeling of irritation. Then they appear again. They are tough, and may be very tiny or as large as a pea. When they break the first time, a thin liquid comes out, which quickly dries. The second blisters are filled with a fluid like pus.

Shingles are most serious in older people. Children usually recover from them quickly. They usually appear on the chest, the back, or the upper part of the face. A common mistake about shingles is the belief that if they start on opposite sides of the body and meet in the middle, the patient will die. There is no truth in this belief.

Shingles are sometimes treated by X ray, ultraviolet, and other means. But the best treatment is usually a program of general health building and rest. P.R.C.

**SHINGLES** are thin pieces of wood which are used to cover the roofs and outer walls of buildings. Roof shingles usually are 16 inches long. They are cut thicker at one end than the other, and they taper from 4/10 to 5/10 of an inch at the thick end to less than 1/8 of an inch at the thin end.

When shingles are nailed on a roof they should overlap so that there are at least three thicknesses at all points. On side walls, however, only two thicknesses of shingles need to be laid over each other.

Shingles are sawed from short, round, or split bolts either parallel to the annual growth rings, or more or less at right angles to them. The former are called *flat-grain* and the latter *edge-grain* shingles. Edge-grain shingles are more desirable because they split less easily in nailing and are less likely to lose their shape from being out in the weather. They also shrink less in width. A roof laid with good edge-grain shingles will last many years longer than one of flat-grain shingles. Flat-grain shingles may last from fifteen to twenty-five years, but edge-grain shingles will last up to forty years and have been known to last over fifty years on steep roofs that shed water quickly.

Over nine tenths of all the wood shingles produced in North America are made of western red cedar in Oregon, Washington, and British Columbia. Western red cedar is used because it is light, has narrow sapwood, and the heartwood does not decay much, and shrinks and warps very little. Other woods used include northwestern white cedar, Atlantic white cedar, southern yellow pine, southern cypress, and redwood. A.K.O.

See also CARPENTRY (How a Carpenter Builds a House).

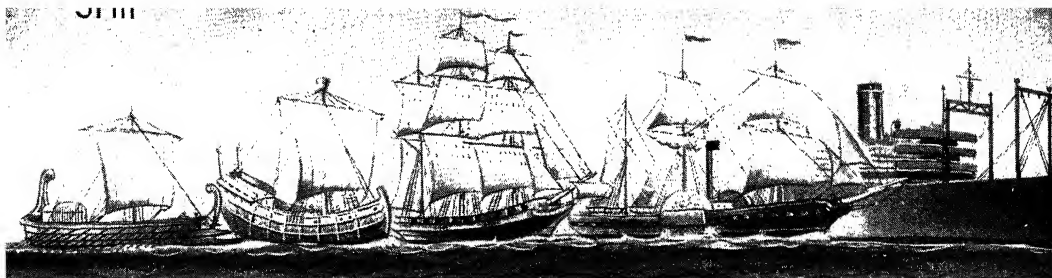
**SHINNECOCK**, *SHIN* ee kahk, **INDIAN**. See INDIAN, AMERICAN (Table of Tribes).

**SHINNY**. See FIELD HOCKEY.

**SHINTO**, *SHIN* toh, is a Japanese religion. Shinto means the "Way of the Gods." It was originally a form of nature worship. Shinto gods were gods of forests, waterfalls, rivers, and the sea. In many Shinto shrines today, such gods are still worshiped. But since Shinto began, the influence of Confucianism has raised its standards of conduct and culture. Buddhist influence brought deeper thought into Shinto. The religion grew to have two elements, Sect Shinto and State Shinto.

*Sect Shinto* centers around the teachings of a particular leader or group. The individual sects carry out programs of religious education and worship through the support of their own members. *State Shinto*, as it developed in the late 1800's, centered around the whole history of the Japanese people. Sect Shinto works to instill religious beliefs in its members. State Shinto aimed to instill patriotism in the Japanese people. This type of patriotism centered around the emperor. He was supposed to be a descendant of the sun goddess, the highest of the Shinto deities. The Government supported State Shinto and the emperor led ceremonies at the Grand Imperial Shrine at Ise and at other national shrines. After World War II, the Japanese Government withdrew its support of State Shinto, and the emperor denied his divinity. But the practice of Sect Shinto by large numbers of the Japanese people continued. G.N.MAY.

See also JAPAN (Religion).



**SHIP.** Any water-borne vessel which seemed large in its own day can rightly be called a ship. The word "ship" nowadays is also given to many kinds of aircraft, and to small naval vessels. But for two hundred years, deep-water sailors have tried to keep the name "ship" for one particular kind of vessel. They define a ship as a vessel large enough to need three masts, and having square sails on all of them. They now use this term for ships of such size which have no sails, as well as for those which have. For small vessels, seamen generally use the term "craft." The word "boat" properly means a small open craft, one without a deck, although the term "steamboat" is frequently used for sizable river steamers.

**Sailing Ships.** This article is concerned chiefly with the larger ships which propel themselves through the water without sails or oars. Sailing ships are much narrower in the beam, or widest part of the hull, and have other important differences in design. If you want to follow the history of ships from the beginning, read the article on SAILING SHIP first, since the two stories overlap.

**Steam and Sails.** At first, steam engines were considered only extra help for the sails of a ship, just as sails for long ages had been thought of simply as extra help for the oarsmen. Robert Fulton's famous *Clermont*, the first financially successful steamship, had sails as well as an engine. Nearly a hundred years later, when the famous warship *Maine* was launched, she was given a full suit of sails. Thomas Brassey (1836-1918), writing in *The Naval Annual*, 1892, said that sails were "indispensable" for English fighting ships.

We can best understand the way in which ships have developed, if we remember that for nearly 6,000 years they used both man power and wind power, and then for a hundred years used the power of both wind and steam. It was not until after 1890 that the chief improvements in ships came from experiments with different kinds of engines.

In order to understand any discussion of ships, we must know that their size and speed are estimated quite differently from the methods used for vehicles traveling overland, and that seamen always refer to a vessel as "she," not "it."

**Tonnage.** There are two chief methods of measuring the size of a ship. They are called registered tonnage and displacement tonnage. These methods generally produce different figures for the same vessel, causing confusion unless the method of arriving at the particular tonnage is understood.

**Registered tonnage** is the measurement used to figure taxes and port charges on ships. Originally it meant a "tun", or very large cask, in which much of the cargo car-

ried by ships was stored. The ship was taxed on the basis of the number of tuns that could be loaded into her hold. In 1694 the British Parliament adopted a law requiring that ships be measured for tonnage by multiplying the length and breadth in a special formula. The formula was supposed to estimate all the cubic space below the deck, but when steamships became common it was necessary to subtract such spaces as the engine room from the gross tonnage, to arrive at a fair net tonnage for tax purposes.

**Displacement tonnage** is an estimate of the amount of water that a ship displaces in the sea. In this article, the tonnage of merchant ships is given by the gross registered tonnage formula, and for naval ships by the displacement formula.

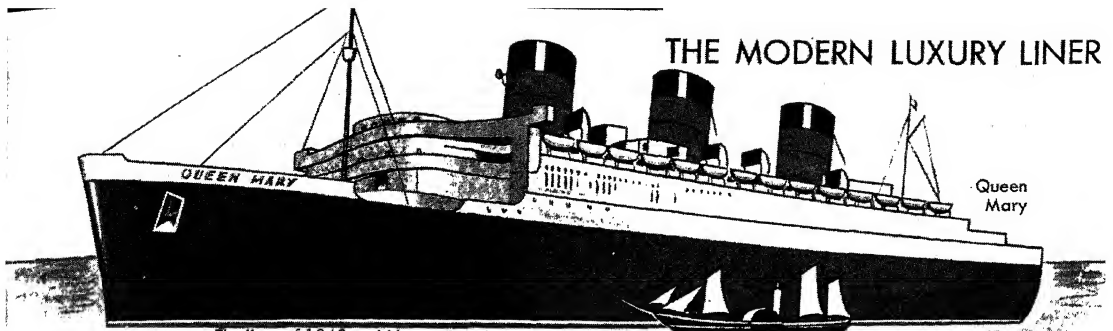
**Speed.** Two very old words are still used in speaking of the speed of a ship at sea. These words are *log* and *knot*. Early estimates of speed were made by throwing a log from the bow, and counting the time it took to float to the stern of the ship. If the vessel was 60 feet long and the log took 6 seconds to pass its length, its speed was estimated at 600 feet a minute. As a nautical mile is 6,080 feet, this would be the same as about a mile in ten minutes, or six miles an hour. Later, it was found that a more accurate measurement could be obtained by dropping the log over the stern of the ship and letting it trail into the clear water behind. Markers were knotted into the line which fed out the log, and the number of these markers which passed over the stern in thirty seconds would give the speed in nautical miles an hour.

More complicated instruments are now used to measure the speed of ships, but they are still called logs. Also, the word knot is still used to describe the rate of speed. The speed of a ship, when estimated in knots, cannot be compared with the speed of an automobile in miles per hour. This is because a nautical mile is 800 feet longer than a mile on shore. A PT boat making 60 knots will be going as fast as a car going 69 miles an hour.

### Invention of the Steamship

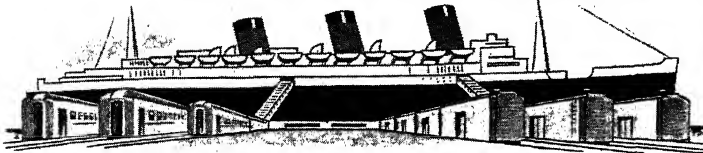
Ancient books mention that the Romans used paddle wheels on ships carrying troops earlier than 200 B.C. The power to turn these paddle wheels is said to have been supplied by driving oxen around a capstan. Some time later, the philosopher Hero described a kind of steam engine which the Egyptians used in religious ceremonies. By the early 1600's, various inventors were at work with steam engines and paddle wheels, but apparently no one yet thought to combine them for the purpose of propelling ships. The first powerful steam-





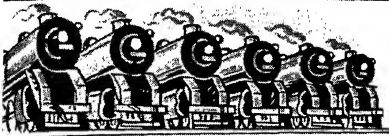
The liner of 1840 could be put into the main foyer and dining room of today's gigantic vessel, with plenty of room to spare.

Britannia, 1840



Sixty-five Pullman cars would be needed to carry the ship's 2,075 passengers. The crew alone would occupy 15 Pullman cars.

A freight train 40 miles long would be needed to carry the weight of the 1,018-foot-long vessel. It displaces 77,500 tons.



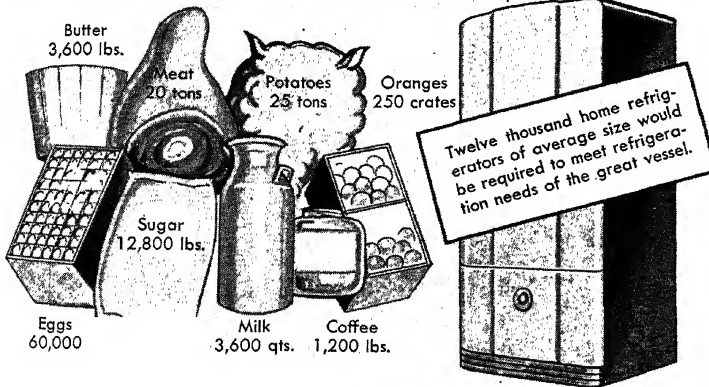
The main engines of the ship develop 200,000 horsepower—as much as 50 modern passenger locomotives or 40 large engines used to haul freight.



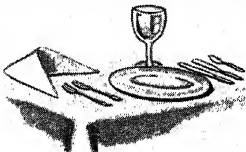
Seven turbo-generators produce 10,000 kilowatts of electricity an hour; enough to supply a city of 150,000 with power and light.

## FOOD FOR A VOYAGE

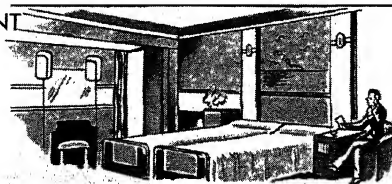
A few of the provisions carried for one round trip



## HOUSEKEEPING EQUIPMENT

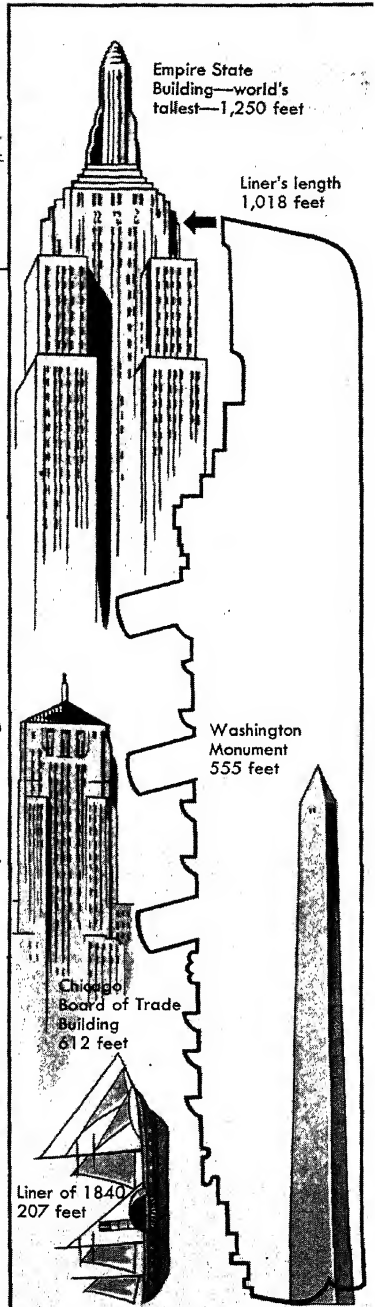


Forty thousand meals are served on a single trip. More than half a million pieces of china, glass, and silverware are in use, as well as 21,000 tablecloths and almost 100,000 napkins.



Linen supplies include 210,000 towels, 30,000 sheets, 31,000 pillow cases, and thousands of other pieces.

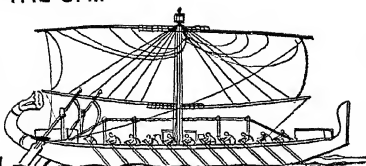
Scores of vacuum cleaners are used every day to clean 6 miles of carpets.



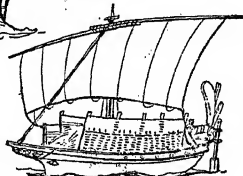
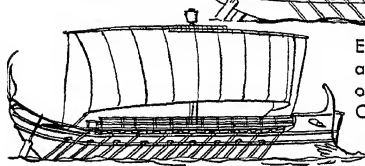
# THE STORY OF THE SHIP

## Oars and Sails

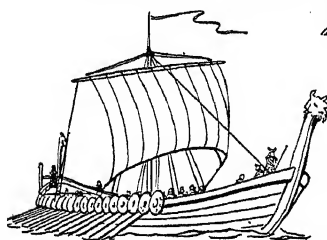
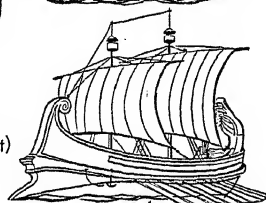
Ship of the  
Ancient  
Egyptians  
1500 B.C.



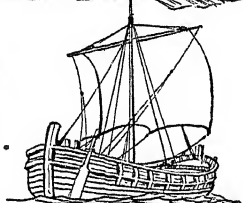
Early Galley (left)  
and Grain Ship (below)  
of the Mediterranean  
Civilizations



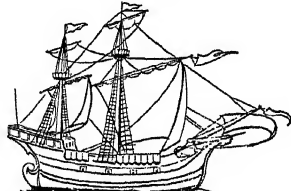
Roman Corn Ship  
(above) and a Galley (right)



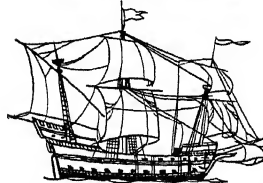
The "Long" Ship (left) and the "Round" Ship  
(right) of the Northern European Seamen



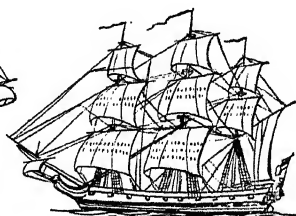
Ship of the  
Middle Ages



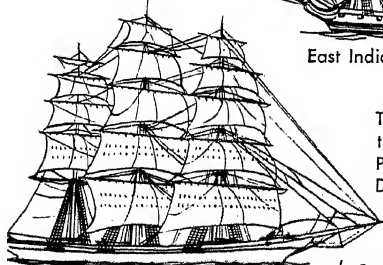
Caravel of Columbus' Time



Spanish Galleon  
of the 1500's



East Indiaman of the 1700's



The Clipper Ship of  
the Middle 1800's —  
Peak of Sailing-Ship  
Development

Vic Goward

7426

## SHIP

engines were used to operate pumps to get water out of mines. Edward Somerset, the Marquis of Worcester, experimented with such a steam engine in 1628. A patent for an engine was issued to him in 1663. In 1699, Thomas Savery, an Englishman, patented a steam engine for pumping water. It was very inefficient, but it would do some jobs that were difficult with man power or animals, and it was put to use in many mines. In 1698 Savery printed a description of a boat propelled by paddle wheels which were turned by man power. His writings also show that he thought steam could send a boat through the water.

According to some historians, Denis Papin, a Frenchman who invented the safety valve, built a steam-operated paddle-wheel boat in the early 1700's. But there is no clear evidence that he did more than to construct a paddle-wheel boat operated by man power.

Thomas Newcomen built a large pumping engine in 1712 which worked well enough to encourage many inventors to draw plans for boats in which it could be used. The best known of these engines was one patented by Jonathan Hulls in 1736. It is doubtful that it was ever actually built. If it had been, it probably would not have worked, for the same reason that prevented early airplanes from flying — the engine weighed too much to do the job it was expected to do.

Another trouble with the early types of steam engine was the need to heat and cool the cylinder for every stroke of the piston. James Watt, an instrument maker at the University of Glasgow in Scotland, was given a model of such an engine to see if he could improve its operation. In 1765, while Watt was working on the Newcomen model, he got the idea which later made the steamboat practical. Watt added a separate cooling cylinder which made it possible to keep the main cylinder at an efficient, high temperature all the time. In 1780, Watt invented the heavy flywheel which helps to turn the jerky motion of the steam piston into a continuous rotary power. Another basic improvement made by Watt was the double-action cylinder. A jet of steam pushes the piston toward one end of the cylinder. This steam jet then is shut off, and another jet from the opposite end of the cylinder pushes the piston back again. With these developments, Watt made steam navigation a certainty.

Oddly enough, however, Watt himself doubted that a steam engine could operate properly in a rough sea. He controlled the important patents, and it was difficult for anyone to build a steamboat except with an engine built by Watt's firm. When anyone did apply for an engine for steamboat purposes, Watt would discourage him.

There were inventors in France and America, however, who did not share Watt's doubts. In 1776 the Marquis de Jouffroy tried to make a steam engine propel a boat which was supposed to be kicked along by devices like duck's feet. It did not work. But in 1783 De Jouffroy tried again, this time with a boat equipped with paddle wheels. It worked for fifteen minutes, and then wore out forever. But this experiment, on a French river, is the first in which a steamboat was definitely proved workable.

In America, two inventors, John Fitch and James Rumsey, were engaged in a strange sort of race to pro-

## THE STORY OF THE SHIP

### Paddle-Wheel and Propeller

#### SHIP

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duce the first practical steamboat. Fitch did not know that Rumsey was working on the same kind of invention. But George Washington had told Rumsey about Fitch's work. Both men had applied to Washington for backing. Rumsey finished his boat first, in 1786, but it broke down during its first trial. Fitch got his boat into operation in 1787. It had a complicated system of paddles, working on long rods. This was the first reliable steamboat. Fitch made many trips, taking members of Congress among his passengers. But a serious disadvantage to Fitch's boat was the fact that it would travel only at a speed of about three miles an hour. Boats propelled by sails or by oarsmen could easily go faster. A few weeks later, Rumsey had a jet-propelled steamer in operation. The engine drove a pump which squirted water from the stern.

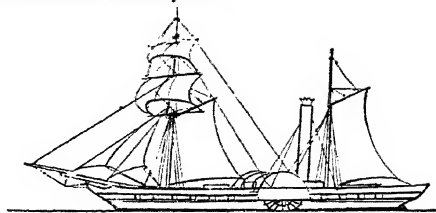
In 1788 William Symington, an Englishman, and Patrick Miller, a Scotsman, made a successful combination of the steam engine and the paddle wheel. Symington built a small engine and installed it in a boat owned by Miller, which already was equipped with paddle wheels. This boat was able to travel at a speed of about five miles an hour.

There were many experiments with steamboats during the next fifteen years, but little real accomplishment. Fitch produced an improved boat in 1790 which ran at a speed of about seven miles an hour. In England, Symington built the *Charlotte Dundas*, which he put into operation towing canal boats in 1802. The *Charlotte Dundas* was a sturdy and well-designed boat, with a single paddle wheel in the stern. The boat operated very successfully, but was taken out of service when the canal's owners began to fear that the waves kicked up by her paddle wheel would wash too much dirt down from the canal banks.

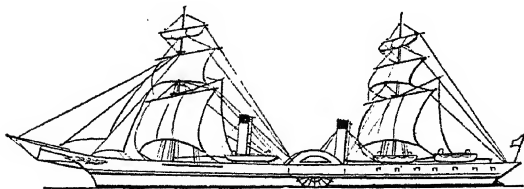
#### Development of the Steamship

Robert Fulton is often mistakenly called the inventor of the steamboat, but he really invented little more than the means of making a steamboat profitable to those who had invested money in it. Robert Fulton began as a portrait painter, but he developed a special genius for turning the mechanical ideas of other men into a practical finished product. In France in 1801 he built a working submarine but was unable to sell it to the French Government. Then, in partnership with Robert Livingston, Fulton built a steamboat in 1803 which ran successfully on the River Seine.

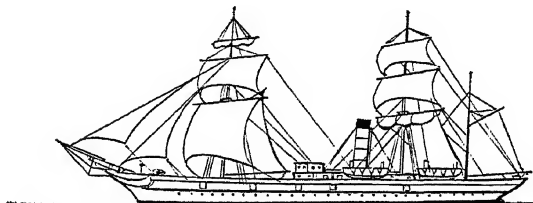
With this steamboat, Fulton got the experience necessary to produce the *Clermont*, the most famous of early steamers. Fulton first named this ship *The North River Steamboat*. He planned it with more engineering care than had been given to any previous steamboat. He made experiments with models in tanks of water to estimate the power that would be needed to drive the vessel. He also studied the relationship between the size of the paddle wheels and the width of the ship. The *Clermont* was large enough to be properly called a ship, but her shape was extremely unusual. At this time, the length of the standard ship was only three times its width. Fulton made the *Clermont* 150 feet long and 13 feet wide, or eleven and a half times as long as it was wide. Later, the width was increased to about 18 feet. The



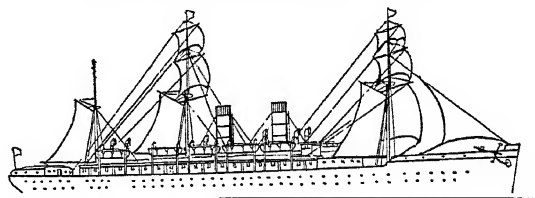
Coastal Steamer of the Early 1800's



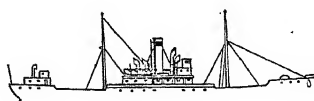
Paddle-Wheel Steamer of the 1850's



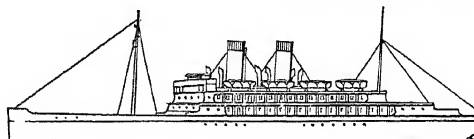
Early Screw Propeller Steamer of the 1860's



Basic Design for Modern Ship Hulls was Developed Between 1870 and 1890



By the 1890's All Sails Had Been Discarded by Steam-Propelled Ships



Steamship Development Reached Its Peak in the Great "Luxury Liners" of the 1930's

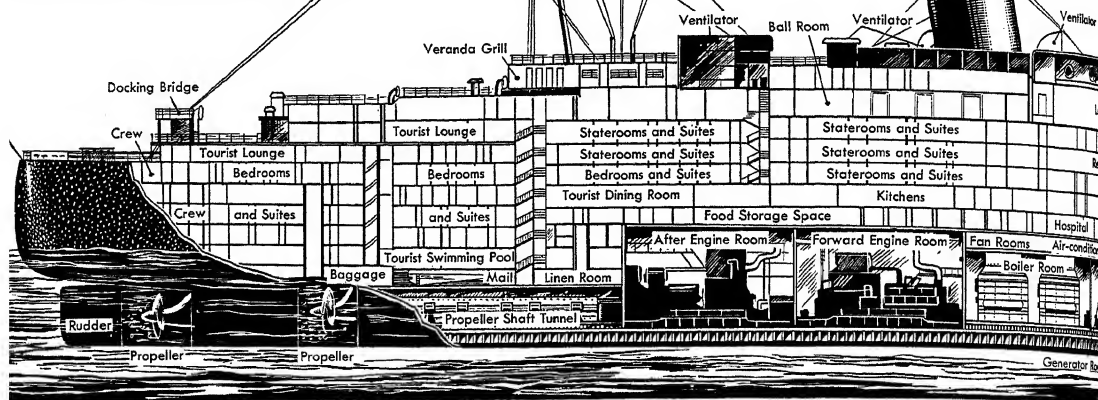
## CROSS SECTION OF A GREAT OCEAN LINER

Displacement Tonnage 77,500

Over-all Length 1,018 feet

Extreme Width 118 feet

Height, Keel to Masthead 234 feet



**Cutaway View of a Large Ocean-Going Passenger Steamship**

first trip of the *Clermont* was made in 1807 from New York to Albany. In about a year, the *Clermont* had earned \$16,000 for Fulton.

After Fulton's success, many river steamboats were built. In 1809, a steamboat for the first time was run in the open ocean. This vessel belonged to John Stevens, who had to get it out of the Hudson River because Fulton had been granted the rights to all steamboat service on that river. In 1811, Livingston and Fulton obtained a similar monopoly on steamboat rights on the Mississippi River. They then built the *New Orleans* at Pittsburgh, but the river proved to be too shallow for this type of vessel.

The typical Mississippi steamboat, which had a very shallow bottom, and all the machinery on deck, was invented in 1817 by Henry M. Shreve.

### Ocean Steamships

The first Atlantic crossing by steamship, made by the American *Savannah* in 1819, has no real importance in the history of steam navigation. The *Savannah* was built as a sailing ship, and the engine was in use only about three or four days of the twenty-one days it took the *Savannah* to make the crossing.

The first ocean crossings of importance in the history of steam were made in 1838, by the *Sirius* and the *Great Western*. The *Sirius* was a small ship built for service in coastal waters between England and Ireland. She ran out of fuel before the end of her trip, but the crew was able to keep up steam for the last few miles by burning some of the ship's masts. The *Great Western* had no difficulty with the crossing. She was a larger ship, 236 feet long and measuring 1,321 tons, and was able to carry enough fuel for the voyage. Like the *Clermont*, she was engineered properly for a specific job. The persons who invested money in the building of this ship received a 9 per cent dividend after her first year in service. It was this ship that interested financiers in investing in deep-water steamships on a large scale.

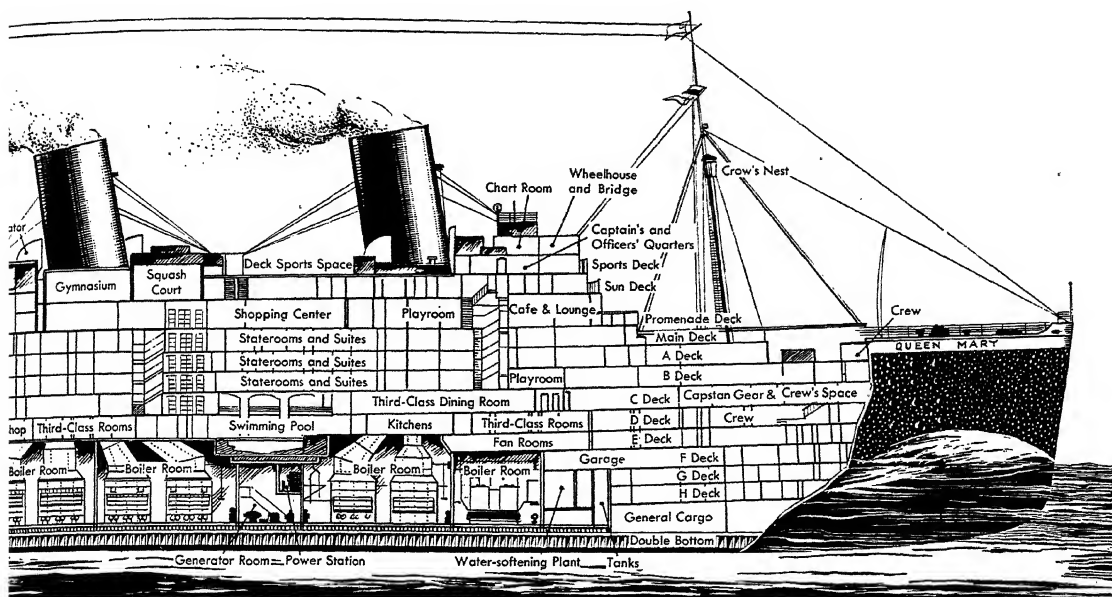
The first and most famous of the present great steamship companies was organized by Samuel Cunard in 1840. In the same year, the Pacific Steam Navigation Company and the Peninsular and Oriental Company were formed. Their operations were made profitable by payments they received from various governments for carrying the mails. Before 1850, the Cunarders were making consistent Atlantic crossings in eleven or twelve days.

In 1850 the Collins line, an American company, put the *Atlantic* and *Pacific*, fast wooden steamers of about 2,800 tons, into ocean service. The *Atlantic* lowered the best Cunard time by 12 hours, and the *Pacific* by a full day. The Collins line soon put into service two other fast wooden steamers, the *Arctic* and the *Baltic*. The owners had great success with these ships until the *Arctic* was sunk in 1854 with a loss of many lives, and in 1856 the *Pacific* simply disappeared, probably having struck an iceberg.

These accidents made it plain to shipbuilders that large wooden ships heavily loaded with engines were not safe.

### Iron Shipbuilding

The owners of the *Great Western*, when they wanted a larger ship, had been advised that only an iron vessel could carry safely the machinery needed to operate it. In 1839 they started to build the *Great Britain*, an iron ship 322 feet long. She first crossed the Atlantic in 1845, in 15 days. During the construction, the design of the ship was altered to provide for a screw propeller. This way of propelling a ship had been proved successful in the small British steamer *Archimedes*, launched in 1838. The United States warship *Princeton*, built at the same time as the *Great Britain*, but put into operation a year earlier, had a very successful screw-propeller mechanism. The *Great Britain* also was rigged as a six-masted schooner, since steam engines were still so undependable that sail power was necessary for emergencies.



Showing Location of Cabins, Engine Rooms, and Other Features

The *Great Eastern*, a remarkable ship 680 feet long, was built in 1854. Forty-five years passed before anyone tried to build another ship as large as this. Originally, the *Great Eastern* had five times the tonnage and twice the length of any other ship. She had both paddle wheels and a screw propeller. These were operated by separate engines which, in all, required five smokestacks. The company which built the *Great Eastern* intended to use her for long voyages from England to Australia. But the company went bankrupt, and the new firm which bought the *Great Eastern* when she was launched in 1858 put her into transatlantic service. The *Great Eastern* was used in laying the Atlantic cable. She was also the first ship to use an engine to operate the steering gear.

The White Star Line launched the *Oceanic* in 1870. The *Oceanic* was quite different from other ships of her time. She was unusually long and slender, measuring 420 feet in length and only 42 feet in width. She had a front, or bow, that was almost straight up and down from the water, instead of the usual curved bows and projecting bowsprit. She was rigged for the sails of a four-masted bark. But she could make a speed of fourteen knots without these sails. This was the first ocean steamer able to beat the best 24-hour run of the great clippers under sail. Shipbuilders improved the efficiency of vessels of the *Oceanic* type, and by the 1870's the time for crossing the Atlantic was cut to less than eight days.

### Steel Ships

The first all-steel ship was launched in 1881. This was the Cunard liner *Servia*, the largest ship at that time except the *Great Eastern*. The *Servia* proved that steel, which is stronger than iron and less brittle, made a lighter hull possible. This gave greater cargo storing capacity, and greater speed.

Another improvement in steamships which accompanied the use of steel was the compound engine. This engine first uses the steam in a high pressure cylinder, and then sends partly cooled steam along to one or more

cylinders operating at less pressure. Using these engines, two Cunard liners, the *Umbria* in 1884, and the *Etruria* in 1885, for the first time attained higher speeds than those of the greatest sailing ships. Both these ships could develop cruising speeds of twenty knots, and the *Umbria* once averaged better than nineteen knots all the way across the Atlantic.

Twin screws or propellers, another important development, were being used on the large liners by 1890. Equipped with these double propellers, the Cunard liner *Majestic* brought the record for crossing the Atlantic down to five days and eighteen hours. But the *Majestic*, like most other ships, was still rigged for sails on three masts. Steamships which had no sails appeared before 1900, however. One of these was the German *Kaiser Wilhelm der Grosse*, built in 1897, which for a time held the speed record for the Atlantic crossing.

### Turbine Ships

After the turbine engine was introduced as a propelling force for steamships, Great Britain's shipping companies quickly recaptured from Germany the leadership in fast Atlantic crossings. The turbine engine converts steam pressure directly into rotating energy by sending jets of steam pressure directly against round metal plates with grooves. Since ancient times, many inventors had worked on this kind of engine, but it was made practical by the work of Sir Charles A. Parsons and Gustav de Laval between 1884 and 1890. Everyone interested in ships was startled in 1897 when the steam yacht *Turbinia*, the first turbine-equipped ship, was able to make a speed of thirty-four knots.

The first very large ships to be equipped with turbine engines were the *Mauretania* and the *Lusitania*, both of which were built in 1906. Each of these ships was 790 feet long, registered 35,700 tons, and had a speed of about 27 knots. These ships had four propellers, all of which were mounted on separate shafts. The *Mauretania* immediately set a new speed record for the Atlantic



crossing, averaging less than five days, seventeen hours from pier to pier. The fastest passage across the Atlantic which the *Mauretania* made was four days, ten hours, and forty-one minutes from the harbor at Queenstown, Ireland, to New York City. This was a speed record that stood for more than twenty years. The *Lusitania* was sunk by a German submarine during World War I.

The turbo-electric drive engine, which turns the propellers of a ship by electric motors powered by a dynamo driven by the steam turbine, was the next major development in propelling ships. With turbo-electric drive, the propeller screws can be reversed simply by operating an electric switch. Most of the large ships now in service use this combination of steam and electricity.

### Motor Ships

During the 1930's there was a great increase in the building of ships powered by oil-burning Diesel engines. These ships are generally called *motor ships*. The Swedish liner *Gripsholm*, which brought wounded soldiers and refugees from Europe and the Orient to the United States during World War II, is one of the most famous of these motor ships. The *Gripsholm* is 553 feet long, and is registered at 18,134 tons. Larger motor ships which have been built include the Italian liner *Augustus*, which is 710 feet and 9 inches long, and of 30,418 tons, and the British *Britannic*, of 26,943 registered tons.

**The Atlantic Blue Ribbon.** The Atlantic Ocean is much more difficult to cross than any other large body of water in the world, because of its very high seas. In the 1930's, the shipping companies of many nations attempted to claim records for crossing the Atlantic. It is hard to decide fairly how these records really compare with each other. Some began to measure time and distance from Gibraltar, some of them from Cherbourg, France, and some from Queenstown (now officially Cobh, a city of Eire).

The German liner *Bremen* made her first, or *maiden*, voyage from Cherbourg in 1929 in four days, seventeen hours, and forty-two minutes, lowering the *Mauretania's* long-held record. In 1934 the *Bremen* made the same crossing and further lowered the record by three hours and fifteen minutes. France put the *Normandie* into the race in 1935. Her best crossing, in August, 1937, was at the highest speed on record, that of 32.1 knots. The *Normandie*, measuring 83,423 tons and 981 feet, 4 inches long, was for some years the largest ship in the world.

The next great ocean liner to appear was the British *Queen Mary*, which registered 81,235 tons, was 1,018 feet long. The *Queen Mary* made a record run from Cherbourg to Ambrose Lightship of 4 days, 12 hours, 24 minutes. This record, set in 1936, beat the *Bremen's* time for crossing the Atlantic by two hours. The largest ship ever built is the Cunard-White Star *Queen Elizabeth*, measuring 88,000 tons and 1,029 feet long. She was launched in 1940, but for six years was used as a wartime troop transport. She made her peacetime maiden voyage in October, 1946, crossing the Atlantic in four days, 16 hours, and 18 minutes.

### Fighting Ships

If private ship owners were slow to accept the steamship, the navies of the world were slower. An early at-

tempt was made to interest the British Navy in steam power. But Lord Napier objected in Parliament that "seamen were prepared to face cutlasses, bullets, shot, and shell, but we do not go prepared to be boiled alive." It is easy to see why these men who spent their lives aboard ships were afraid of steam. A shot fired through the wooden sides of the ship might strike the boiler and scald many of the crew, and also might even sink the ship. During the days of wooden ships, therefore, navies of the world only took over the chief improvements of the steamship after they had been carefully tried out in merchant-marine service.

During the early 1900's, however, the navies of the world assumed that great naval wars would soon have to be fought. They therefore took the lead in making better ships. In addition to improving the size and speed of war vessels, as compared to those in the merchant marine, two entirely distinct types of war vessels were developed. These were the submarine and the aircraft carrier. Various new types of landing craft were also designed but navies became equal to the ships of the merchant marine only with the launching of the British battleship *Dreadnought* in 1906. The *Dreadnought* was equipped with turbine engines like the *Lusitania* and *Mauretania*, which were launched in the same year.

For many years the fighting ships of the United States Navy have far outclassed our merchant vessels in speed, and few of our merchantmen have compared with them in size. The battleships *New York* and *Texas*, which were begun in 1911, displaced 27,000 tons, had a length of 566 feet, and a top speed of 19 knots. In 1912, the United States Navy launched two new battleships, the *Oklahoma* and *Nevada*, of 29,000 tons displacement. Between 1913 and 1915 the United States Navy launched five battleships with turbine engines, each displacing about 33,000 tons. Five more, displacing 32,000 tons, were built between 1918 and 1920. These were the *California*, the *Tennessee*, the *Maryland*, the *Colorado*, and the *West Virginia*.

The size of the next six battleships built by the United States Navy was limited to 35,000 tons displacement, by the rules set up by a treaty agreed to by the United States, Great Britain, Germany, Italy, and Japan.

During World War II ten more battleships were built. At least six of these were faster and 10,000 tons larger than any of those which had been built before. At the start of the war, the United States had what was called a one-ocean navy, concentrated in the Pacific. Before the war was ended, however, so many ships had been built that fleets were provided for every ocean on the earth.

The war vessels built during World War II for the United States Navy included twenty-seven large airplane carriers, 110 escort airplane carriers, and 45 cruisers. A number of new types of ships also were developed during World War II. About 50,000 of these were landing craft, so equipped that the bows would open and let down a platform, or ramp, over which soldiers and such vehicles as tanks, trucks, and armored cars could run.

At the end of the war, officials of the United States Navy felt that the future size and speed of ships would be greatly affected by atomic power development. A. L.

## Nautical Terms

The following are terms commonly used aboard ships:

**Abaft.** Used to show a position to the rear of any part of a ship.

**Abeam.** An object seen on either side of a ship, near an imaginary line drawn across her middle, is said to be abeam of her. The wind is abeam when it blows from one side, rather than from ahead or astern.

**About.** The direction opposite to that in which the ship is sailing.

**Aft.** Near the stern of a vessel.

**Aloft.** Above the main deck of a vessel.

**Amidships.** The middle of a vessel, either with regard to her length or breadth.

**Ballast.** Any material used to keep a ship loaded so it will be stable.

**Batten.** A bar, usually of iron, used to hold down canvas hatch covers.

**Beam.** The widest point on a ship's hull.

**Below.** Beneath the main deck.

**Bilge.** The lowest part of a ship's hull.

**Binnacle.** A stand near the steering wheel, which holds the compass, compensating magnets, and a light.

**Bitts.** Pairs of metal or wooden heads on the deck used to moor a ship to the dock, or to fasten running rigging.

**Bridge.** The platform, built above the main deck, from which a ship is steered and navigated.

**Broadside.** The side of a ship above water.

**Bulkhead.** A wall or partition separating rooms, holds, or tanks.

**Bulwarks.** The extension of the ship's sides reaching above the deck to form a rail.

**Bunkers.** The compartments in which coal is stowed.

**Capstan.** A vertical metal drumlike barrel mounted on deck to aid in moving heavy objects with rope.

**Chain Locker.** The compartment in the forward part of the ship, where the anchor chain is stored.

**Companionway.** A set of steps leading from the deck to a cabin, and the space taken up by the steps.

**Cradle.** Part of the ship's frame, which holds booms when they are lowered.

**Davit.** A curved metal spar fitted into the deck and used for hanging small boats or handling weights.

**Draft.** The distance from a ship's keel to the water line.

**Flare.** The outward curve of a ship's side from the water line to deck level.

**Flush Deck.** One long upper deck with no breaks for forecabin, well, or poop decks.

**Forecastle, FOHK's'l.** The upper deck forward of the foremast. It is also a section in the bow where the crew lives.

**Forepeak.** The part of the ship below decks in the bow.

**Forward.** The fore part of a ship.

**Freeboard.** The distance from the water line to the main deck.

**Galley.** The ship's kitchen.

**Gangplank.** A ramp lowered from the side for boarding or leaving the ship.

**Gear.** A general name for ropes, blocks, and tackles.

**Glass.** The sailor's name for the barometer.

**Gunwale, GUN el.** The upper edge of a ship's or boat's side.

**Hatch.** An opening in a ship's deck for handling cargo.

**Heel.** The lower end of any vertical part of a vessel, particularly the stern post.

**Hold.** The space below decks where cargo, ballast, and stores are kept.

**Hull.** The floating body of a ship.

**Inboard.** Toward the center line of the ship.

**Iron Mike.** An automatic steering device which keeps a ship on her course.

**Keel.** The timber or bar forming the backbone of the ship, running from the stem to the sternpost at the bottom of the hull.

**Lanyard.** A small rope to hold an object such as a knife, or bucket, or working tool.

**Larboard.** The port, or lefthand, side of a ship when facing forward.

**Lee, or Leeward.** The direction away from the wind.

**Leeway.** The drift of a vessel to leeward caused by the wind or tide.

**List.** The inclination of a ship away from the vertical, caused by too much weight on one side.

**Mooring.** Tying a ship to a dock or buoy.

**Nautical Bell.** Time is kept aboard ship by the ringing of bells every half hour. One bell is rung at 4:30, 8:30, and 12:30 o'clock. Each half hour the number of rings is increased by one until eight bells are rung at 4, 8, and 12 o'clock. Thus the ship's day is divided into six watches of four hours each.

**Overhang.** The projection of the stern beyond the sternpost and of the bow beyond the stem.

**Pitching.** The fore-and-aft rocking motion of a ship, caused by the action of the sea.

**Poop Deck.** A partial deck at the stern over the main deck.

**Port.** The lefthand side of a ship looking forward.

**Porthole.** An opening in the ship's side, usually round and fitted with glass and metal covers.

**Quarter.** The part of the ship's sides near the stern.

**Quarterdeck.** That part of the upper deck reserved for officers.

**Ribs.** The frame pieces making the side of a ship.

**Rigging.** The fixed ropes and wires holding the masts are called *standing rigging*. The movable ropes that operate the sails are called *running rigging*.

**Rolling.** The side-to-side motion of a ship caused by the action of the sea.

**Rudder.** The flat metal or wooden piece fastened to the sternpost, by which the ship is steered.

**Screw.** Another name for the propeller.

**Scupper.** An opening in the ship's side to allow water to drain from the deck and from drains.

**Seaworthy.** Able to meet usual conditions at sea.

**Sheer.** The upward curve of a deck running forward and aft.

**Shipsshape.** Neat, in proper order.

**Starboard.** The right-hand side of the ship looking forward.

**Stay.** A rope or wire support for a mast in a fore-and-aft direction.

**Stem.** The upright post in the foremost part of a vessel rising from keel to forecabin.

**Stern.** The after part of a ship.

**Taffrail.** The bulwarks around a ship's stern. Taffrail is a corruption of *tafferel*, which means a wooden panel, not a rail.

**Waist.** That part of the main deck between the forecabin and the quarter deck.

**Weather.** The direction toward the wind, opposite to lee.

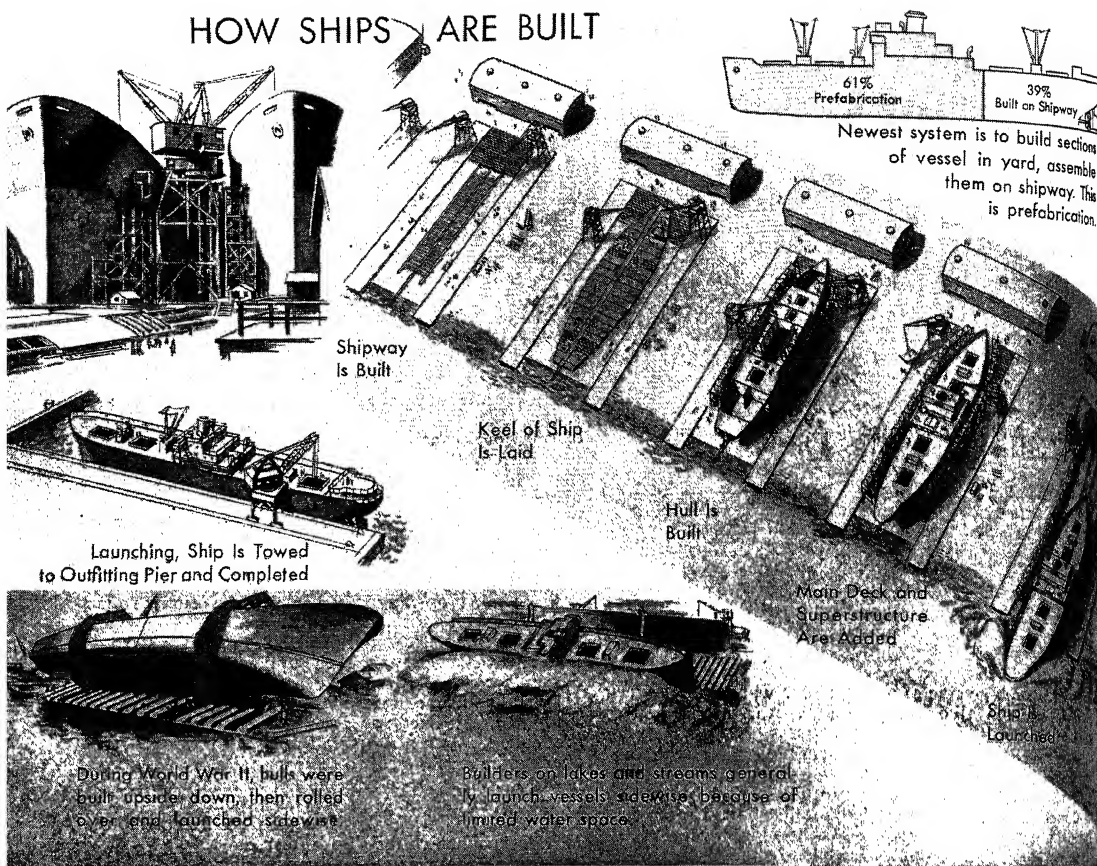
**Well Deck.** That part of the main deck between the poop and forecabin decks.

**Windward.** The direction toward the wind.

**Related Subjects.** The reader is also referred to:

Anchor	Log
Barnacle	Logbook
Boats and Boating	Navigation (with list)
(with list)	Plimsoll Mark
Dock	Port
Dry Dock	Propeller
Ericsson, John	Shipbuilding
Fitch, John	Shipping
Flag (Flag Customs)	Signaling (Marine
Floating Dock	Signaling)
Fulton, Robert	Tonnage
Gyrostabilizer	Yachting
Knot	

# HOW SHIPS ARE BUILT



Alabama  
Clermont  
Constitution, The  
Flying Dutchman  
Ironsides

## FAMOUS SHIPS

Leviathan  
Maine  
Savannah  
Titanic

## KINDS OF SHIPS

Battleship  
Galleon  
Galley  
Icebreaker  
Landing Craft  
Navy (Names of Naval Ships)

Rotor Ship  
Sailing Ship (with list)  
Steamboat  
Tanker  
Trawler  
Trireme

## Questions

How do deep sea sailors define a "ship"? What do they call smaller vessels?

In what two ways may the size of a ship be measured?

What two very old words are still used in speaking of the speed of a ship? What is the source of each of these words?

Who first thought of using paddle wheels on ships? When?

Who first invented a workable steamship with paddles? When?

Who invented the first practical steamboat in America? What famous American aided this inventor by lending him money?

What inventors first combined the steam engine with paddle wheels in a ship? When?

Did Robert Fulton invent the steamboat? What contribution did he make to shipbuilding?

When was the first all steel ship launched? What ship was this?

What form of power do most large ships use today?

What new types of ships were developed during World War II?

What is meant by each of the following terms: (a) ballast? (b) bridge? (c) galley? (d) hatch? (e) nautical bell?

What is the difference between *port* and *starboard*?

**SHIPBUILDERS, AND HELPERS OF AMERICA, INTERNATIONAL BROTHERHOOD OF.** See INTERNATIONAL BROTHERHOOD OF BOILERMAKERS, IRON SHIPBUILDERS, AND HELPERS OF AMERICA.

**SHIPBUILDING.** It probably required the labor of many weeks for primitive man to make a water-borne vessel by hollowing out a tree trunk with his flint hand ax. Thousands of years later, elaborate sailing ships were often more than a year in the building. But during World War II modern tools and mass production methods made possible the assembly of large freighters from the keel up in less than a week.

**A Modern Shipyard** is one of the most interesting sights in industry. Huge cranes swing great parts of ships into position and workers swarm over the partly finished hulls like ants over a picnic cake.

Briefly, a ship is put together in the following manner. The plans are first brought to a hall-like room called the *mold loft*. Here patterns are cut for the plates and other parts of the ship. These patterns are sent to the fabricating shops, where the parts are rolled and cut from steel. Many of the parts which make up a ship come to the shipyard ready for installation. Lifeboats from Indiana, hoists from Wisconsin, compasses from Massachusetts, and other fittings from all parts of the country are joined

together to form the completed vessel at the shipyard.

The hull of the ship takes shape on the *ways*. This is a slanting concrete platform, down which run long pieces of heavy wood called *ground ways*. The ship's keel, or backbone, is laid on large pieces of heavy wood called *keel blocks*. *Sliding ways* are large pieces of wood which are built in a frame under the hull of the ship to form a cradle. When ready for launching, the ship is eased into the water by means of heavy grease placed between the ground ways and the sliding ways. The sliding ways go into the water with the ship. They are held in position by steel tie plates while the ship is being built. Usually a ship is only 60 to 80 per cent completed at the time of launching. *Outfitting*, or equipping the ship with masts, cabins, cargo-working gear, and generally all the parts of a ship above the main deck, remains to be done.

**History.** As long as ships were made of wood, they were built mostly in those countries with large timber reserves. From the end of the Middle Ages until the 1700's, these forests were found mostly around the Baltic Sea and along the northwestern coast of Europe. That is why England, Holland, and the Scandinavian countries were the leading shipbuilders of the time.

Shipbuilding became important in North America in the late 1700's, especially in the English colonies. Oak, pine, and ash, the best wood for ships, were plentiful in the New World. Here also were abundant quantities of pitch, rosin, and other naval stores. By the time of the American Revolution, about 400 vessels were launched in the colonies every year.

With the coming of iron and steel ships, those countries in which shipbuilding had first developed again took the lead. But the adoption of the new materials was slow. It was not until the 1870's that iron vessels became common. Great Britain then took the lead in shipbuilding. By 1893 the shipyards in the British Isles launched more than three fourths of the world's tonnage. Later, France, Germany, and the United States also became great shipbuilding countries.

During World Wars I and II, the nations were racing to build enough ships to replace those sunk by submarines, mines, and other disasters at sea.

British shipping suffered more than that of any other country in World War II. American shipyards did a large part of the job of repairing and building ships for the United Nations. These yards turned out 1,881 ships in 1944. At the end of the war the United States had a fleet of nearly 6,000 merchant ships, with a gross tonnage of more than 55,000,000.

General economic conditions greatly affect the shipbuilding industry. A ship is large and expensive, and modern methods of building require large investments. Shipyards are built for a single purpose and cannot be converted to other uses. The demand for ships varies widely from year to year.

A. LAL.

See also COLONIAL LIFE IN AMERICA (Lumbering and Shipbuilding); KAISER, HENRY J.; NAVAL STORES; NAVY YARD; SHIP.

**SHIPBUILDING WORKERS OF AMERICA, INDUSTRIAL UNION OF.** See MARINE AND SHIPBUILDING WORKERS OF AMERICA, INDUSTRIAL UNION OF.

**SHIP MODEL** is a small copy of a regular-sized ship or boat. Almost every boy at some time in his life takes



Ewing Galloway

**A Ship Model Takes Form** under the steady hands of a youthful craftsman. It will represent a naval escort vessel.

pride in making a model boat of some kind. It may be a tiny sailboat, which he can sail on the park lake. It may be a simple, flat tugboat, cut from a block of wood, with a rubber band working a propeller.

Building model ships is a favorite hobby of many persons, both young and old. Sailors while away dreary hours at sea during long voyages by making tiny replicas of their favorite boats. Sometimes very tiny models are made. Much care may go into the carving of the smallest details. Some model ships are fitted with small motors, which are run by steam or electricity. Sailboats, complete with rigging and sails copied from famous boats, are popular collectors' items. Model ships may be of any size, and copied from any kind of ship. Sometimes model shipbuilders enter their craft in races. The builders learn more about constructing better and more interesting models in this way.

An interesting hobby is making and collecting model ships enclosed in narrow-necked bottles. Clever construction and sail-rigging permits the ships to be built inside the bottle.

E.S.

See also HOBBY (illustration, "Making" Hobbies).

**SHIP MONEY** was a tax which early kings of England sometimes imposed on persons and communities to pay for national defense. It was finally abolished in 1640.

**SHIP OF THE DESERT.** See CAMEL.

**SHIPPING.** The first sailors to specialize in long voyages with cargoes of goods for trade were the Phoenicians, who built up a great trade along the shores of the Mediterranean Sea in about 1000 B.C. Four hundred years later they still dominated the trade of the eastern Mediterranean. The Phoenician sea traders were followed by the Greeks and the Syrians, who carried a great deal of the Mediterranean trade for the Roman Empire.

Much of the sea commerce of the Middle Ages was

carried by merchants of the city states such as Venice, Genoa, Hamburg, and Bremen. As a rule the merchants owned the ships as well as the cargoes, hence the name *merchant shipping*.

The discovery of new lands in the 1400's and the 1500's enlarged the scope of world shipping. It then became dominated by the Spanish, Portuguese, Dutch, and English, who sought to establish new trade routes to the New World and the Far East. The change of shipping to a business not owned mainly by merchants began in the 1600's in Europe. The change took place slowly, and it was not until 1817 that the Black Ball Line was started as the first common ocean carrier between New York City and Liverpool.

For many years, most of the world's commerce was carried in *tramp* ships, which sailed from port to port, exchanging one cargo for another. A good part of shipping is still carried by tramp steamers. But most sea commerce today is carried by *line shipping*, or shipping which operates over regular routes on schedules. Stock companies, corporations, and governments now control most of the world's ships.

In the late 1800's the companies began to control by means of conferences the rates and kinds of cargo carried by different lines. By 1909 these conferences were world-wide.

A recent development in ship control is the operation of fleets owned by industries. Most of the world's oil is carried in tankers owned by oil companies.

World Wars I and II affected world shipping to a great extent. Most of the countries took over private ships for the war purposes of shipping men and materials to the distant fronts. Eighteen governments in World War II placed their merchant ships in the Allied Shipping Pool, to supply more effectively their armies for winning the war. The United States built many cargo ships, and ended the war with the largest merchant marine in the world.

A.LAI.

**Related Subjects.** The reader is also referred to:

Bill of Lading	Merchant Marine
Express Service	Parcel Post
Manifest	Shipbuilding
Maritime Commission	Transportation

**SHIPPING SUBSIDIES.** See MERCHANT MARINE.

**SHIP'S LOG.** See LOG.

**SHIPTON, MOTHER**, was an English peasant woman who was believed to be a witch and a prophet. There is no positive proof that she ever really existed, but the legends say that she was born in Yorkshire about 1486 or 1488. She was called "the Devil's Child," and very early she became known for her prophecies. Her most sensational prediction foretold the deaths of Cardinal Wolsey, Lord Percy, and other men who were prominent at the court of Henry VIII.

Mother Shipton was first heard of in 1641, when an anonymous pamphlet called *The Prophecie of Mother Shipton* was published in London. Other pamphlets followed which were supposed to contain her prophecies. In 1862 Charles Hindley reprinted a mixed-up version of the life of Mother Shipton, which was originally published by Richard Head in 1684. In this book Hindley credited her with predicting the invention of the steam engine, the electric telegraph, the automobile, the air-

ship, and the end of the world in 1881. In 1873 Hindley confessed that his work was a forgery, but the prophecy of the end of the world caused great alarm in the rural districts of England. At the predicted time in 1881, many persons deserted their homes and remained all night in the fields and in churches to pray.

H.A.M.

**SHIPWORM.** See TEREDO.

**SHIRE, shire.** The shire was an early geographical division of England. Shires had about the same boundaries as modern counties. They were first formed in the early Anglo-Saxon states, and were made up of a number of smaller districts called *hundreds*. For many years after England was united under a king, the shires continued to have a degree of self-government. See also ENGLAND (History, Anglo-Saxon Period).

J.S.A.

**SHIRE, SHE ray, RIVER.** See NYASA, LAKE.

**SHITEPOKE, SHITE pohk.** See HERON.

**SHOAT, shoht, or SHOTE.** See HOG.

**SHOCK.** Sometimes a blow, a wound, a burn, or some other accident is a severe shock to the entire body. The vital processes of the body are stunned and weakened. The control of blood-flow through the body is upset. The blood vessels near the skin dilate, the patient's skin is warm, and he perspires and feels faint. The blood pressure drops and the pulse grows weak. These reactions are followed in an hour or so by a condition called *secondary shock*. The patient then loses his color and grows weaker. The blood pressure grows lower, the pulse feeble, the breath becomes short and weak, the perspiration is cold, and the blood vessels near the surface of the skin collapse. The patient may lose consciousness and, if the condition is not corrected, he may even die. Secondary shock is very common in severe wounds and operations. It is best treated by complete rest, warmth, stimulating drugs, and blood plasma. See also FIRST AID (Shock).

H.R.V.

**SHOCK, ELECTRIC.** See SAFETY (Safe Use of Electricity).

**SHOCK TREATMENT.** Insanity, melancholia, and other mental ailments are sometimes cured by means of a shock. Electric shock is the most successful, but drugs also are used to induce shock.

*Insulin* is often used for dementia praecox or schizophrenia, and was the first method of shock treatment to be used extensively. But some patients died from the large amounts of insulin necessary to produce the shock, and another drug, *metrazol*, was tried. Metrazol caused fewer deaths, but it produced more severe convulsions. The patient's muscles sometimes contracted with such a powerful spasm that he broke his own bones. Shock induced by an electric current proved to be the best and safest method. In one American hospital, over 92 per cent of the patients treated for a type of melancholia were either cured or greatly improved. Over 80 per cent of the patients with manic-depressive insanity were cured or improved.

In giving the electric shock, a round electrode about an inch and a half in diameter is placed over each of the patient's temples and connected to the source of electricity, a shocking machine. An automatic timer regulates the length of time the current is on, usually less than a second. The patient loses consciousness immediately and has a brief convulsion. Then he sleeps.



When he awakens he has no memory of the treatment and is temporarily almost normal. During this period of normalcy the patient is usually treated by a psychiatrist who discusses his problems with him and suggests solutions. The electric shock is thus not the entire means of cure. It helps the psychiatrist by bringing insane persons briefly to a clear point of view which allows them to respond to psychiatric treatment. A convulsion is an essential part of the shock treatment. The exact mechanism by which good results are obtained is not as yet clearly understood.

H.R.V.

**SHODDY** is a woolen cloth which is made of yarn that has been used before. The Federal Wool Products Labeling Act, adopted in 1939, requires that shoddy be labeled in such a way that a purchaser will know that the goods are made of used yarn. Since then little shoddy has been made. Clothmakers found that wool which was admitted to be rewoven was hard to sell. The name, *shoddy*, has come to mean any cloth of poor quality.

G.G.Dr.

See also CONSUMER EDUCATION.

**SHOE.** Early man made shoes long before he made records of what he thought or did. He made shoes to protect his feet against rough stones, hot sand, and cold weather. Shoes were so important in man's early life that he often gave them magic powers in stories and legends. The tales of Puss in Boots, Cinderella, the Seven League Boots, and the winged sandals of Mercury are only a few of our very old stories about magic or unusual shoes.

#### Early Shoes

The first shoes were probably pieces of hide or braided grass held to the foot by leather cords. This shoe was a kind of sandal. This simplest kind of sandal is still worn in warm countries. The *pampootie* of the island fishermen of western Eire is an example of the simple sandal. Sandals like this are also worn in China and Japan. The moccasin was worn in colder countries. This was made by tying a baglike covering over the foot with a string. Many early tribes covered their legs with rough skins, which were held in place by cords tied to their sandals. The earliest boot was made by joining the bottom of this leg covering with the sole of the sandal.

In early days shoes showed the rank or wealth of the wearer. This was true among the Greeks, Romans, and the early Egyptians. High rank was shown by long, pointed toes and different kinds of decoration. In the 1300's a shoe called the *crakow* had a pointed toe so long that a chain had to be used to hold it up so its wearer could walk. In the reign of Queen Elizabeth of England, the *duckbill* shoe was made so wide that a law was finally passed keeping it less than five and one-half inches wide. The *chopins* was a wooden shoe with an iron ring to help its wearer lift his feet from the mud. The *jack boot* had a large cufflike top high on the thigh. It was worn by gentlemen and soldiers from about 1650 until 1775. Jack boots were so heavy and fit their wearers so tightly that men had to be helped in and out of this clumsy footwear.

Most shoes today are made from leather. Wood and fabric are also used for different purposes, and in different parts of the world. In The Netherlands the

wooden shoe is still worn. In France, wooden-soled shoes are used, and even in America they are used by workers in so-called "wet industries," such as breweries and dairies. Shoes of various fabrics are common in the countries of the Orient.

**The Early Cobbler.** Although many changes took place in types of shoes throughout the years, little care was given to fitting them properly. The shoemakers of the Middle Ages paid little attention to the shape of the foot. Their art was directed more to fancy decoration. Many samples of their work are still to be seen, but only as examples of strange workmanship. Until 1850, both shoes of a pair were made from one last. That is, there was no such thing as a right shoe or a left shoe. They were made the same for both feet. At this time, the traveling shoemaker, or cobbler, still used the same type of simple awl, knife, scraper, and other hand tools which the ancient Egyptian sandal maker had used. Later, the cobblers' customers began to demand more comfortable shoes, and a different last was used for each foot.

The first American shoemaker was Thomas Beard, who came to Salem, Mass., in 1629. The cobblers of colonial and early American days traveled from house to house, making shoes for each family. Elias Howe's sewing machine, patented in 1846, was used for sewing soles to shoes by Lyman Blake of Abington, Mass., in 1858.

This was the first time that machines were used for making shoes. Gordon McKay took Blake's invention and introduced it to the shoemaking industry generally in 1862.

**The Modern Shoe Factory.** There are more than 200 operations for the making of a single shoe today. The shoe factory is usually divided into eight operating departments, each of which has a different part of the manufacturing process.

In the *cutting room*, all the leather or fabric used in the upper part of a shoe is cut into the proper shape and size. The shoe linings are also cut in this room. Usually this cutting is done by machine. When fancy shoes are made in small quantities they are sometimes cut by hand.

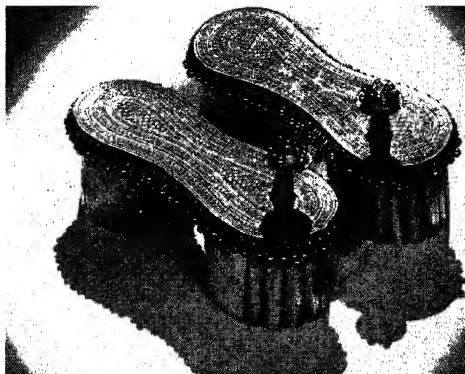
The second operation takes place in the *stitching room*. Here the different parts of the upper shoe and lining are stitched together to make a finished shoe upper. In making this finished shoe upper, all the other operations needed are done here, such as punching designs in toes, punching eyelets for the laces, and making buttonholes.

The third job takes place in the *stock-fitting* or *sole-leather* room. Here, all the parts making up the lower part of the shoe are made and put together. These include insoles, outsoles, counters, and box toes. *Counters* are pieces shaped to fit into and shape the heel of the shoe. *Box toes* do the same thing for the toe.

In the *lasting room*, the different shoe parts are assembled and shaped on the last. The last is a wooden or metal form which gives shape to the shoe. Lasting is highly skilled work, as the shoe must be shaped evenly all around so it can stand an even strain in all parts when it is worn.

The fifth operation, called *bottoming* is one of the

# SHOE



The Sultana of Zanzibar kept these fancy slippers on by clasp-  
ing the jeweled knobs between her big and second toes.



An Ornate Lounging Slipper,  
or mule, of the early 1700's



This Simple Leather Sandal  
was worn by an Egyptian child.



Leather Slippers of an aristocratic Frenchwoman of the late  
1700's have exceedingly high and slender heels.



The Fancy Boot of a Moslem's Favorite Wife is made of  
fine morocco leather, with hand-tooled braidwork.



Sturdy but Clumsy Wooden Shoes keep feet dry and  
warm in many parts of The Netherlands, France, and Belgium.

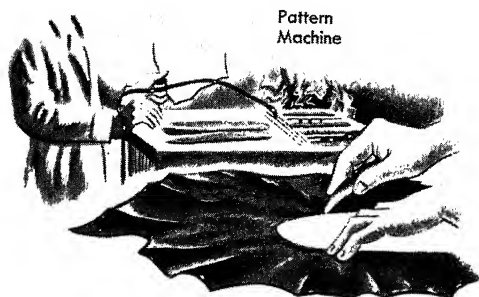


on this Russian woman's fur-topped boot.

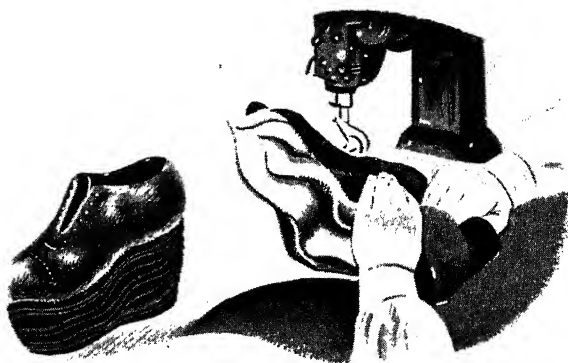


A Picturesque Modern Shoe combines the design of the  
classic sandal with a springy, comfortable, sponge-rubber sole.

# HOW SHOES ARE MADE



**Cutting Room.** Leather and fabrics for the upper part of the shoe are cut carefully from patterns.



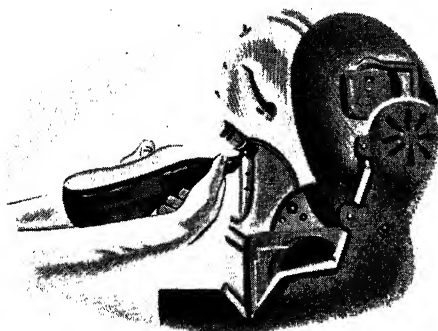
**Stitching Room.** A sewing machine stitches together the leather and fabrics to form the upper part of the shoe.



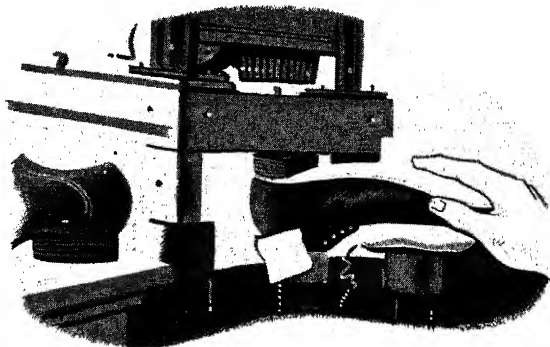
**Stock Fitting.** Soles are made from heavy leather by a metal press which forces the punch through the leather.



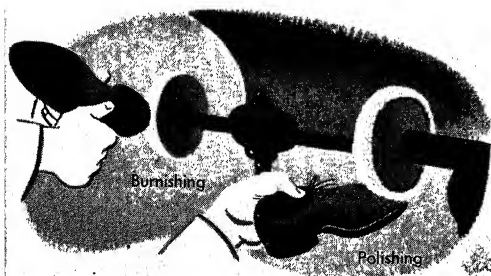
**Lasting Room.** The upper-shoe parts and the inner sole are fitted on a foot-shaped last and sewed together.



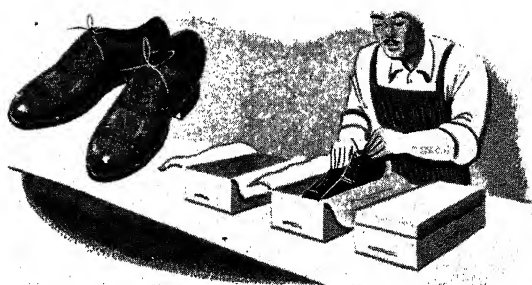
**Bottoming.** The heavy durable outersole is attached to the shoe by high-speed stitching, with strong thread.



**Making Room.** Leather or rubber heels are attached to the shoe by means of a high-pressure nailing machine.



**Finishing.** The edges of the sole are trimmed and burnished, and then the shoe is colored and polished.



**Treeing and Packing.** Laces are added, and the shoes get a final cleaning before being packed for shipment.

most important in shoemaking. Here the outsole is attached to the rest of the shoe. There are three chief ways in which the outsole is attached to the shoe. These are by sewing, cementing, or nailing.

In the sixth operation, in the *making room*, the heel is attached to the shoe, and trimmed.

In the *finishing room*, the bottoms of the shoes are scoured lightly, a finishing wax or gum is applied, and the bottoms are polished.

In the eighth and last operation, called *treering and packing*, the shoe gets its final cleaning and dressing. Laces, bows, or buckles are put on, and the shoes are ready to pack after a final inspection.

**Shoe Production.** The United States leads the world in making shoes. Salem, Mass., and the surrounding cities are the leading shoe-producing cities in the United States as they have been since the time of Thomas Beard. Besides Massachusetts, leading shoe-making states include New York, Missouri, Pennsylvania, New Hampshire, Illinois, Maine, Wisconsin, and Ohio. The shoe industry turns out about 500,000,000 pairs of shoes every year.

**Vocational Opportunities.** The shoe-manufacturing industry employs about 250,000 persons. Thousands of others are engaged in the wholesale distribution and retail selling of shoes. There are excellent opportunities for advancement in the industry for factory workers, office employees, salesmen, accountants, and shoe-style designers.

**Shoes and Health.** Shoes should be bought with the idea that they are made to protect and support the feet. They should be chosen for shape, fit, and quality of material. Size is no sign that shoes will fit, and wearers should learn to pick shoes that follow the shape of the foot. Heels should be from three fourths of an inch to one and one-half inches high for best daytime wear. Only with properly fitted shoes will the wearer avoid the pain of having small foot bones pushed out of place.

W.H.D.

See also LEATHER; MOCCASIN.

**SHOEBILL.** The shoebill is a large, strange-looking bird related to the stork. It is sometimes called the *whale-headed stork*. The shoebill was once thought to be the rarest of birds. But a number of them live in Africa,

on vast marshes from the Upper Nile to Uganda and the Belgian Congo. The bird stands about four feet high and is colored an ashy gray. It has an enormous bill shaped like a shoe, from which it gets its name. The bill ends in a large hook. When the bird is frightened or disturbed, it snaps its bill open and shut rapidly with a loud rattling sound.

The bird is long-legged and likes to wade in shallow water, where it feeds on fish and snakes. It flies somewhat as the heron

does, with its neck curved in the shape of an S, its long black legs trailing behind. Shoebills live in pairs and sometimes prey on small animals. They do not build their nests in trees, but make a large platform of reeds lined with grass to nest in. The female shoebill lays one or two rough-shelled white eggs.

R.M.m.

**Classification.** The shoebill is the only member of the *Balaenicipitidae* family. Its scientific name is *Plegadis falcinellus*.

**SHOEMAKER, VAUGHN.** See CARTOON Cartoonists).

**SHOEMAKER TRAINING AND DISTRIBUTION CENTER,** an army training camp. See FRESNO.

**SHOESTRING REPUBLIC.** See CHILE.

**SHOGUN, SHO goon,** is a Japanese word which means *great general* or *commander in chief*. For many hundreds of years before 1867, the shogun was the real ruler of Japan. The man who held the title was the representative of the Japanese emperor. But the emperor had little to do with governing the empire. All power was in the hands of the shogun class, or *shogunate*.

Various feudal lords struggled to control Japan from the late 700's until 1192. In that year Emperor Takahira created the office of *Sei-i-tai-shogun*, which means *barbarian-subduing great general*. The feudal lord Yoritomo took the title of *shogun* and ruled Japan in the name of the emperor. Later generals and princes fought for and held the title and power of shogun.

In 1867 Japanese noblemen overthrew the shogun, and gave the ruling power back to the emperor. Foreigners sometimes referred to the shogun as a *tycoon*. This English word is from the Japanese word *taikun*, which means *great lord*. The end of the shogun system marked the beginning of the end of the old samurai military system in Japan.

M.F.L.

See also JAPAN (History, Rule of the Shoguns); SAMURAI.

**SHOLES, shohlz, CHRISTOPHER LATHAM** (1819-1890). See TYPEWRITER; WISCONSIN (Famous Men and Women).

**SHOLOKHOV, SHAW loh kawf, MIKHAIL** (1905- ). See RUSSIAN LITERATURE (Soviet Literature).

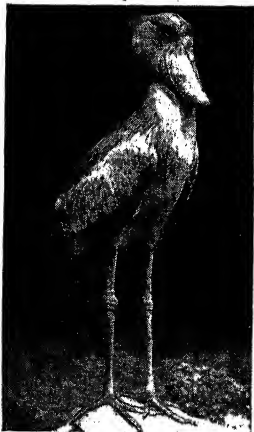
**SHOOTING.** See ARCHERY; FIREARM; GUN; HUNTING.

**SHOOTING STAR.** See METEOR.

**SHOOTING STAR, or AMERICAN COWSLIP.** See COWSLIP; FLOWER (color plate, Mountain Flowers [American Cowslip]).

**SHOPPING.** See CONSUMER EDUCATION; HOME ECONOMICS (with reading list).

**SHORE PATROL.** The Shore Patrol is the police department of the United States Navy. It is made up of selected officers and enlisted men with ratings of petty officers. They patrol shore areas that are occupied or visited by members of the Navy. In some cases, the Shore Patrol has authority over members of all branches of the service. Members of the Shore Patrol receive special training. They wear regular navy uniforms, and a brassard, or band, with the yellow letters S.P. on their arm. They carry a night stick and wear leggings and a khaki belt. The Shore Patrol has the power to arrest Navy men and enforce discipline, but it cannot punish anyone. An offender is turned over to his commanding



N. Y. Zoological Society

The African Shoebill

officer for trial. During World War II, the Shore Patrol was made up of permanent members. In peacetime, however, any petty officer may be assigned to the Shore Patrol for temporary duty.

The Shore Patrol has taken over police duties ashore formerly handled by members of the United States Marine Corps. These duties include guarding navy buildings and other shore installations, riding navy transport trains, returning men who have been absent without leave, and patrolling places of entertainment frequented by navy men on leave.

R.Col.

See also **MILITARY POLICE**.

**SHORT, WALTER CAMPBELL** (1880- ). See **WORLD WAR II** (Pearl Harbor Attack).

**SHORT BALLOT.** The short-ballot movement was organized in an effort to secure a simple ballot, with the names of only a few chief candidates. Most voters do not know the qualifications of all the candidates for office whose names appear on a long ballot. The supporters of the short-ballot movement believe that it would be wiser to vote for a small number of key candidates. The names of the less important officials would not appear on the ballot at all. These officials would be appointed by the elected officials.

On election day the voter often finds himself confronted with a ballot containing column after column of candidates' names. He has probably never heard of most of them, and he is interested in only a few of the most prominent ones. The lesser candidates have usually been picked by political machines without aid from the public.

But if there were only five or ten names on the ballot, the voter would be able to investigate the fitness of those who seek to manage the affairs of the public. He could then cast a much more intelligent vote. Woodrow Wilson called the short ballot "the key to the whole problem of the restoration of popular government."

A short ballot would centralize the responsibility of government in a small body of elected officials. These officials would be given an opportunity to appoint their assistants on a basis of their fitness for office. Many persons believe that the affairs of a city or county should be conducted on strictly modern business principles. The short ballot offers a further step in this direction.

The short ballot in a county might contain only the names of candidates for county commissioners or supervisors. These men, the direct representatives of the people, would select the public officials to serve under them. In some states people are suggesting that only the governor, lieutenant governor, and judges shall be elected, and that all other state officers shall be appointed. Some progress has been made in the use of the short ballot. In many states and counties, as well as cities, the number of elective offices has been gradually reduced, and ballots have thus been shortened. F.F.B.

See also **BALLOT**.

**SHORT CIRCUIT.** See **FUSE, ELECTRIC**.

**SHORTER COLLEGE** is a woman's school at Rome, Ga. It is controlled by the Baptist Church, but students of all faiths may attend. Courses are offered in the liberal arts and sciences. Students live in residence-hall suites. The college was founded in 1873. Enrollment is limited to about 250.



Hinsey, Black Star

**SHORTHAND.** It is impossible for the average person to write in longhand as fast as even the slowest speaker speaks. The speed of average speech is about 160 words a minute. But few persons can write even as many as sixty words a minute. The only way to write as fast as people speak is by using a system of symbols called *shorthand*, or, sometimes, *stenography*.

Shorthand greatly speeds up writing. The fastest shorthand writers can write more than 250 words a minute, and most shorthand writers are able to reach a speed of 150 words a minute. Court reporters must be expert in shorthand, because they must take down all the exact words spoken during a trial. Most court reporters can write well over 200 words per minute. Stenographers do not need to be as fast as court reporters, because few people dictate as fast as they ordinarily speak. A speed of from 130 to 150 words per minute is enough for most stenographers.

There are two main systems of shorthand symbols, the Gregg and Pitman systems.

### The Gregg System

The Gregg method was invented by John Robert Gregg in 1888. Gregg introduced his system in England and later brought it to the United States. It uses a set of shorthand symbols that represent the different *sounds* of letters and letter combinations, rather than the letters themselves. Each of the symbols is a part of an oval, or *ellipse*. Gregg shorthand emphasizes *writing* the symbols, rather than *drawing* them. In this way, the shorthand notes flow along in the same smooth style as longhand, but much more quickly.

**Consonants.** Since Gregg symbols are based on the sounds of letters, there is a close relationship between the symbols which represent letters that sound alike. The consonants are grouped according to their sounds, with the characters for such letters as *V* and *F* differing only in size. On the following page is a table of Gregg consonant groups.

**Vowels.** The vowel symbols in Gregg follow two rules:  
(1) The characters are related according to their similarity of sound.

(2) The most easily written characters are those which represent the most-used vowels.



## FORWARD STROKES

## DOWNWARD STROKES


## CONSONANT

## CONSONANT

SYMBOL WORD

SYMBOL WORD

as in key

as in pay 

" " gay

bay

" " ray

F

fan

" " lay

V 

van

" " need

Sh

shame

M " " may

Ch



chain

T " " tea

J

jam 

D " " day

S  or  as in sale

" " hat

sit

Th  " " though

thin

The same symbol represents all three of the different pronunciations of *a*, *e*, *o*, and *oo*. The beginning shorthand student usually marks the medium pronunciation of these vowel sounds with a dot below the shorthand symbol, and the long pronunciation by a dash. This helps the beginner to read his notes. However, expert shorthand writers transcribe their notes by content and do not waste the time for marking pronunciations.

## VOWEL

## SYMBOL

## VOWEL

## SYMBOL

ā as in cat



ō as in shot

calm



aw " audit



ode

din

tuck

hen

took

dean

doom

$\bar{U}$  is considered as a combination of the  $\bar{e}$  and  $\bar{o}$  sounds and is written by combining the symbols for these sounds.  $\bar{I}$  is also considered a vowel combination, or diphthong, and is symbolized by combining the characters for  $\bar{a}$  and  $\bar{e}$ . Following are examples of Gregg vowel and diphthong symbols:

## DIPHTHONG



Made up of

## SYMBOL


## DIPHTHONG

Made up of

## SYMBOL

 $\bar{e}-\bar{o}$  aw- $\bar{e}$  $\bar{a}-\bar{o}$   $\bar{a}-\bar{e}$ 





**Abbreviations.** Some of the words that are most commonly used are represented in Gregg by their chief consonant sounds. The writer picks up time by using these abbreviated shorthand outlines. The following words are common Gregg abbreviations:

WORD	MAIN CONSONANT	SYMBOL
Will, well	L	
Good, go	G	
Change, which	Ch	
Shall, ship	Sh	
Can	K	
Would	D	
Our, are, hour	R	
Have	V	
Put	P	

**Phrasing.** After the shorthand student has mastered the symbols which represent the different sounds in Gregg and has learned a good many of the common abbreviations, he learns still another short cut to speed. This is phrasing. The consonants and vowels in Gregg flow so smoothly that it is not necessary for the writer to take his pen point off the paper for whole phrases. Thus a very long phrase may be written as one continuing character and the writer saves time.

There are many set phrases which occur in all shorthand, and these the shorthand student usually learns from a textbook. In addition, most writers work out phrasing techniques of their own for phrases which are used frequently in their particular line of business.

The following are examples of phrases that may be written as continuous characters in Gregg:

in reply		we will not
would be able		as many as
very respectfully		at an early date
for the time being		in the matter

**Speed Pointers.** The way to attain speed in shorthand is to master thoroughly the principles of the system, to acquire the ability to write all abbreviations and phrases without hesitation, and to practice on all types of dictation as frequently as time, inclination, and physical comfort will allow. It is advisable to engage in such practice for about an hour each day.

## The Pitmanic System

There are four standard systems of Pitmanic shorthand — Isaac, Benn, Graham, and Munson Pitman. Isaac Pitman, an Englishman, invented the first system of Pitmanic shorthand in the 1830's. The other systems are very much like the original system, varying in only

about twelve characters each. Writers of any one of the four Pitmanic systems can usually read the others.

Pitmanic shorthand, like Gregg shorthand, is based on the *sounds* of letters, rather than the letters themselves. The symbols are represented by curved- and straight-line characters.

**Consonants.** The consonants in Pitman shorthand are grouped according to their sound. Consonants that sound somewhat alike are often represented by the same character. But the shading of the symbol indicates the difference in sound. The following are examples of Pitmanic consonants:

CONSONANT	SYMBOL	CONSONANT	SYMBOL
P as in Pope		S " "	
B " " babe		Z " " zeal	
T " " tight		Sh " " wish	
D " " dead		Zh " " azure	
Ch " " church		L " " lull	
J " " judge		Y " " yea	
K " " kick		R " " oar	
G " " gag		W " " way	
H " " hay		M as in main	
F " " fife		Mp " " hemp	
V " " vat		Mb " " embody	
Th " " pal		Ng " " thing	
Th " " thy			

**Vowels.** Light and heavy dots and dashes represent vowel sounds in Pitmanic shorthand. The position of the symbol is very important, as it gives the shorthand reader the clue to the pronunciation, and makes it unnecessary to write the vowel. At the top of the next column on this page are examples of Pitmanic vowel symbols.

**Abbreviations and Combinations.** To abbreviate common words, Pitman shorthand uses combinations of the consonants in the words. There are hundreds of such

VOWEL	SYMBOL	VOWEL	SYMBOL
ah " "		odd	
ate			
eel			
all		oo " " took	
oak		i " " ice	
ooze		oi " " oil	
at		ow " " owl	

abbreviations in Pitman shorthand.

The letters *t* and *d* are added to words by making their consonant signs half length. Thus, the word *act* is written with the symbol for *k* only half length. Doubling the length of a consonant stroke adds the sound *thr*. A small circle at the beginning or end of a word adds the sound *s*. A circle twice as large adds the sound *ses*. A short enclosed loop after a consonant adds *st*, and a loop twice as long adds *str*.

**Phrasing.** Pitman writers increase the speed of their shorthand through phrasing, in much the same way as Gregg writers do. Some common phrases of Pitmanic shorthand follow:

	I trust that		in order to
	in receipt of		in reference to
	regret to say		very respectfully
	with regard to		yours very truly

### History

Shorthand was an ancient art, but was apparently lost to the world for more than seven hundred years. In 100 B.C., Marcus Tullius Tiro, secretary to Cicero, invented a crude shorthand system which he called *brief writing*. Others enlarged on the system, and by A.D. 400 it contained 13,000 characters. In the 700's, after the fall of the Roman Empire, the art of brief writing disappeared.

The beginnings of modern shorthand date from 1588, when Timothy Bright, an Englishman, prepared a list of several hundred words with abbreviations. It was not practical, but inspired others to similar efforts. The best system of the 1600's was explained by William Mason in a textbook, *A Pen Plucked from the Eagle's Wing*. But not until Pitman published his *Stenographic Soundhand* in 1837 did shorthand writing command the attention of the entire world.

Today, shorthand is important in the business world. Instruction in shorthand is given in most high schools, and in business colleges.

E.CON. and G.B.O.

See also BUSINESS EDUCATION; DICTATING MACHINE; PHONETICS; PITMAN, ISAAC, SIR; SPEEDWRITING; SPELLING; STENOTYPE.

**SHORTHORN.** See CATTLE (Kinds of Beef Cattle).

**SHORT-HORNED GRASSHOPPER.** See LOCUST.

**SHORTSIGHTEDNESS, or NEARSIGHTEDNESS.** See NEARSIGHTEDNESS.

**SHORT STORY.** The short story is usually shorter than a novel, or book-length story. It is also commonly shorter than what we consider a tale. Popular short stories today are published in magazines and periodicals, or in book collections of short stories.

The difference between the short story, the novel, and the tale is usually more in subject matter than in length. The tale usually tells incidents which are or pretend to be traditional or legendary. It tells these things somewhat as though they were true, and it does not concern itself very much with describing characters or emotions. Washington Irving's *Rip Van Winkle* can be called a tale.

The novel takes time to create moods and settings and to go into descriptions of characters. Its plot may cover a long period of time and deal with many characters, settings, and incidents.

The short story is quicker in its action than the novel, and more dramatic than the tale. It somewhat resembles the drama. In general it has to do with few characters, the time covered in its plot is short, and the changes of place are few. It is a kind of concentrated story. Because of its limitations, it usually deals only with some one incident or crisis in human relations.

Edgar Allan Poe is usually considered the writer who made the short story form of fiction writing popular in America. His stories, *The Cask of Amontillado*, and *The Pit and the Pendulum*, are good examples of the dramatic way in which short stories are usually written.

The art of short-story writing has today become so widely practiced and its forms are so various that it is almost impossible to define or describe them. Notable short stories have been written by Guy de Maupassant of France, Anton Chekhov and Ivan Turgenev of Russia, Katherine Mansfield of England, and writers in nearly every language.

S.M.S.

**Related Subjects.** The reader is also referred to:

Fiction

Parable

#### SOME SHORT-STORY WRITERS

Chekhov, Anton P.	Mansfield, Katherine
France, Anatole	Maupassant, Guy de
Harte, Bret	Parker, Dorothy
Hawthorne, Nathaniel	Poe, Edgar Allan
Henry, O.	Runyon, Damon
Irving, Washington	Stevenson, Robert L.
London, Jack	Turgenev, Ivan S.

**SHORT TON.** See TON.

**SHORT WAVE** is a term used in radio for wave lengths representing higher frequencies than are used for the ordinary broadcast transmissions.

The classification of the different frequency bands above 3,000 kilocycles (abbreviated kc.) is as follows:

Frequency in Kilocycles	Frequency Designation	Wave Length in Meters
3,000-30,000	High (abbrev. HF)	100-10
30,000-300,000	Very high (VHF)	10-1
300,000-3,000,000	Ultra high (UHF)	1-0.1
3,000,000-30,000,000	Super high (SHF)	0.1-0.01

Short waves carry farther without serious attenuation than the regular broadcasting waves. Short waves are generally used to broadcast to foreign countries and other distant places. They are also used by amateurs, and in F.M. (frequency modulation) broadcasting, in television programs, and for transoceanic telephone conversations. Special equipment is needed to receive short-wave broadcasts. Many radio receivers bring in both regular and short-wave broadcasts. Short waves exhibit certain peculiarities, such as *skip distances* (areas they skip over).

P.H.C.

**SHOSHONE, shoh SHO nee, or SHOSHONI, INDIAN.** See INDIAN, AMERICAN (Seed Gatherers of California and the Great Basin; Table of Tribes; color plate, Shoshoni Women Scraping Buffalo Hide).

**SHOSHONE CAVERN NATIONAL MONUMENT.** See NATIONAL MONUMENT.

**SHOSHONE DAM**, officially known as BUFFALO BILL DAM, provides irrigation and electric power production on the Shoshone River, seven miles west of Cody, Wyo. It is a concrete structure of the radius-arch type. The dam is 328 feet high with a top thickness of 10 feet, a crest length of 200 feet, and a volume of 78,576 cubic yards of concrete. The reservoir has a capacity of 456,600 acre-feet. Buffalo Bill Dam was one of the first projects built by the United States Bureau of Reclamation. It was completed in 1910. The dam was renamed Buffalo Bill Dam by Public Law 323 which was signed by President Harry S. Truman on March 11, 1946. See also DAM.

**SHOSHONE FALLS.** See IDAHO (Rivers, Springs, Lakes, and Waterfalls); SNAKE RIVER.

**SHOSTAKOVICH, shuh stuh KAW vyich, DIMITRI DIMITRIEVICH** (1906- ), is a leading composer of the Soviet Union. He was born in Saint Petersburg (now Leningrad), and studied music at the Leningrad Conservatory. His *First Symphony*, which he wrote at the age of nineteen, won him world-wide attention. In his earlier works Shostakovich wrote in a satirical modern style. His operas *The Nose* and *Lady Macbeth of Minsk* were in this style. They displeased the Soviet authorities, who declared the works "bourgeois decadence." But Shostakovich regained the approval of the government with his *Fifth Symphony*, which was produced in Leningrad in 1937 to honor the twentieth anniversary of the Bolshevik Revolution. His "Piano Quintet" won the 1941 Stalin Prize.

During the German siege of Leningrad in 1941, Shostakovich composed his *Seventh Symphony*. In 1945, he wrote the gay *Ninth Symphony*.

F.B.

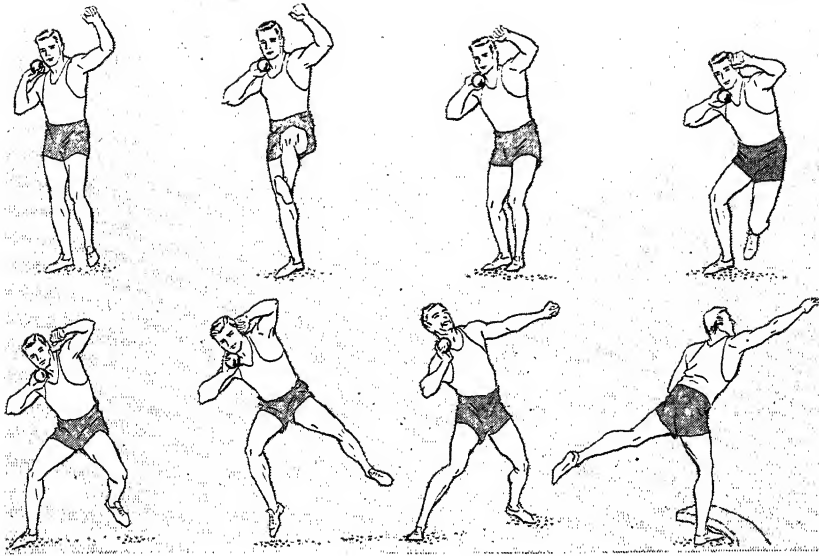
**His Works** include the ballet "The Golden Age" with its popular "Polka"; and some piano preludes and chamber music.

**SHOT.** See SHOTGUN.



Sovfoto

**Dimitri Shostakovich, Soviet composer of symphonies**



The Various Positions Assumed in Putting the Shot

**SHOTE**, *shoht*, or **SHOAT**. See Hog.

**SHOTGUN.** The shotgun is a shoulder gun which fires cartridges containing an explosive charge and a load of lead pellets called *shot*: The shot is spread over a wide area, making it easier to hit a moving target with a shotgun than with the single bullet from a rifle or a pistol. Shotguns are therefore most widely used for hunting small game.

The size of a shotgun is measured by bore, or gauge. The weight of the lead ball which would be required to fit the muzzle of the gun is the standard of measurement for the bore. If a bullet weighing one twelfth of a pound fits the bore, the shotgun is called a 12-bore, or a 12-gauge, gun. The standard types of shotguns are 10, 12, and 16 bore. A 12-bore shotgun is accurate and powerful enough to kill small game at from 55 to 75 yards.

The first shotgun was the matchlock arquebus loaded with small shot instead of one round ball. These guns were developed in 1537. In 1831 Augustus Demondion patented a breech-loading gun and a cartridge which held small shot. Modern shotguns are single-barreled, double-barreled, or single-barreled with automatic repeating magazines which hold from three to five cartridges.

R.Col.

See also ARQUEBUS; FIREARM; SHOT TOWER.

**SHOT-PUT** is a test of strength in track and field meets. In ancient days a heavy stone was used in the shot-put. Today an iron ball is used. Senior athletes use one weighing 16 pounds, high-school boys use one of 12 pounds, and beginners use 8-pound balls.

Success in shot-putting depends upon ability to get the whole force of the body behind the heave. The put is made from inside a circle which is seven feet in diameter. At the front there is usually a wooden cleat or strip of wood. The shot-putter stands at the back of this circle. He balances the shot in his hand between the palm and the central fingers. He then hops forward to a position with his leading foot near the cleat. He propels

the shot, and as he does so his momentum forces him around so that the positions of his two feet are reversed and so that his weight is well forward on the other foot. His arm is thrust out in a long follow-through. The shot can be sent into the air most effectively at an angle of forty degrees. The measurement is made from the nearest edge of the first break of ground to the nearest point on the shot-put circle.

E.D.M.

**SHOT TOWER.** In colonial times, shot towers were a common sight in the eastern colonies. The colonists made bullets for their muzzle-loading rifles in these wooden or brick towers, which were from fifty to a hundred feet high. Melted lead was poured through a vessel with holes at the top of the tower. As each bit of lead dropped, it formed a round ball and was cooled in this shape when it landed in another vessel containing cold water at the bottom of the tower.

R.Col.

**SHOULDER** is the part of the body between the arm and the trunk. The shoulder consists of several bones which fit together in a joint like a ball in a socket. The shoulder joint allows more freedom of movement than any other joint of the body. These bones are tied together by bands of stringy fiber called *ligaments* to keep them in place. The shoulder muscles work with the bones. The muscles are tied to the bones by bands of fiber called *tendons*. In the back of the shoulder is the shoulder blade, or *scapula*.

The shoulder may be easily injured because it is so movable. The bones may become fractured from a fall. They may sometimes become dislocated from the joint because of a sprain or fall. A dislocated shoulder bone must be reset and usually requires a plaster cast to keep it in place. Sometimes tendons or ligaments may become torn and it is necessary to place the arm in a sling to keep it still.

A.B.H.

**SHOUP**, *shoop*, **GEORGE LAIRD** (1836-1904), was the first governor of Idaho. He was born at Kittanning, Pa., and for a time was a farmer in Illinois. In the War between the States he served as a colonel in the Union

Army. In 1866 he went to Idaho. When the state was admitted into the Union in 1890, he was chosen its first governor, but resigned shortly after to enter the United States Senate. Shoup served as Senator from 1890 to 1901. See also **STATUTARY HALL**. E.E.R.O.

**SHOVELBOARD**, *SHUV* 'l *bohrd*, a form of the game shuffleboard. See **SHUFFLEBOARD**.

**SHOVELER**, or **SPOONBILL**, is a small river duck of the Northern Hemisphere with a spoon-shaped bill. It lives in North America, Europe, and Asia in summer, and migrates south in winter to Colombia, North Africa, and southern Asia. The upper portion of the bill overhangs the lower. The male has a green head, white breast, and chestnut-colored belly. It feeds in shallow water, poking its head under the water, or, more often, along the surface, for mollusks, insects, and roots. It takes a mouthful and strains the mud and water out through "gutters" in the sides of its bill, leaving the food trapped inside. The birds nest on the ground, sometimes quite a distance from water. The female lays six to fourteen pale greenish to bluish-white eggs. The female is said to take two mates during its life. See also **BIRD** (color plate, Wild Ducks); **DUCK**. J.J.H.

**Classification.** The shovelers belong to the family Anatidae. The common shoveler is *Spatula clypeata*.

**SHOW.** See **CIRCUS**; **DOG** (Dog Shows); **EXPOSITION**; **FLOWER** (Flower and Garden Clubs); **INTERNATIONAL LIVE STOCK EXPOSITION**.

**SHOWA**, *SHO wah*. See **HIROHITO**.

**SHOWBOAT.** See **MISSISSIPPI RIVER**.

**SHOW ME STATE.** See **MISSOURI**.

**SHOWY LADY'S-SLIPPER.** See **FLOWER** (color plate, Flowers of Lake, Stream, and Swamp); **LADY'S-SLIPPER**.

**SHRAPNEL** is a form of artillery charge which was formerly used in army field guns and naval cannon. During World War I shrapnel was considered one of the most reliable and effective charges for shells. It was little used during World War II, however.

Shrapnel was invented by Lieutenant Henry Shrapnel (afterward a lieutenant general) of the British Army. The inventor began his investigations of hollow projectiles in 1784, and his first shell was used in Surinam in 1804. The shell contained a number of balls and a charge of powder which burst the shell. A shower of bullets was forced out by the explosion. R.Col.

See also **ARTILLERY**; **PROJECTILE**; **SHELL**.

**SHREVE**, *shreev*, **HENRY MILLER** (1785-1851). See **SHIP** (Development of the Steamship).

**SHREVEPORT**, La. (population 98,167), is the second largest city in Louisiana. The Louisiana State Fair is held every year in October in Shreveport. The city was named for Henry Miller Shreve, one of its founders. See **LOUISIANA** (Rivers, Bayous, Lakes, and Bays).

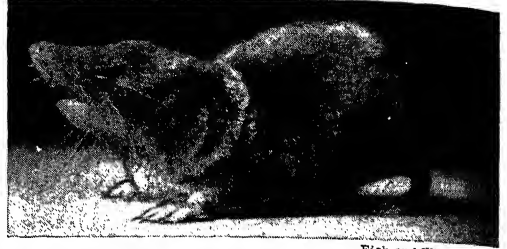
Shreveport lies on the Red River in northwestern Louisiana. It is about 275 miles northwest of New Orleans and about 200 miles southeast of Dallas, Tex.

Shreveport became an important industrial center after the near-by Caddo oil field was discovered in 1906. Today the natural gas in this region furnishes fuel for the city's factories. The city has cotton gins and compresses, cottonseed-oil mills, oil refineries, iron and steel foundries, railroad shops, glass plants, fertilizer factories, timber mills, and brickyards.

Shreveport at first was called Shreve Town or Shreve's Landing. It became the capital of Caddo Parish and was incorporated as the city of Shreveport in 1839.

Shreveport was the Confederate state capital during the latter part of the War between the States. Railroads were built here in the 1870's and the 1880's and the city grew as a lumber-shipping point. W.Pr.

**SHREW**, *shroo*. Shrews are very small animals which look like mice. Some of them are the smallest animals known which nurse their young. The shrews live in



**The Tiny Shrew Is a Tremendous Eater.** The shrew is valuable in gardens because of the great number of insects it devours. Fish and Wildlife Service

many places in both the Eastern and Western hemispheres. They make their homes in fields, woodlands, and gardens. Some of them live part of the time in water, and others stay among the marshes.

Shrews are often mistaken for mice because of their small size, but their habits and bodies are more like those of the moles. Shrews make long tunnels in the forest leaf-carpet, and follow the path made by mice. Shrews have long, slender snouts which they can move at will. Their eyes and ears are tiny, and their bodies and tails are covered with short, dark hair. Some of the smaller species are less than two inches long and weigh less than a dime. The largest shrew in America is the *water shrew*, which is six inches long, including the tail.

Shrews eat more insects and worms than anything else, but they may attack young birds and other small creatures of the woods. Sometimes they even attack mice larger than themselves. Their bite is slightly poisonous.

Several larger animals, such as weasels, foxes, and owls, prey upon the shrews. But the shrew's strong musky odor is a good protection from some of its natural enemies.

One of the species in the United States is the *short-tailed shrew*, or *mole shrew*, of the East. This tiny animal has a taste for fish. Another is the *shrew mouse* which lives in large numbers around marshes and streams. It is lighter in color than the mole shrew.

Shrews are harmless little creatures from man's point of view. They are even useful in gardens, for they eat insects and grubs. R.T.H.

See also **TREE SHREW**.

**Classification.** Shrews belong to the family *Soricidae*, in the order *Insectivora*. The water shrew is *Sorex palustris*. The short-tailed is *Blarina brevicauda*. The long-tailed shrew is *Sorex cinereus*.

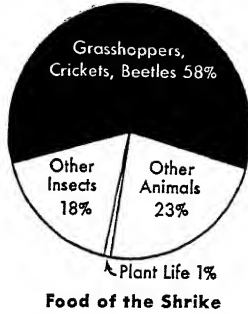
**SHREWSBURY**, *SHROOZ* *ber ih*, **SCHOOL** was founded by King Edward VI, and is one of England's leading schools. After a period of decline in the 1700's, the school was restored to a leading position by two great headmasters. Samuel Butler, who served from 1798 to



1836, raised the standards of scholarship. Benjamin Kennedy, headmaster from 1836 to 1866, added modern studies and encouraged interest in music and sports. I.L.K.

**SHRIKE.** Shrikes can easily be recognized by their strong, slightly hooked beaks, and by their unique habit of thrusting grasshoppers, mice, and smaller birds onto thorns, fence barbs, or forked twigs, much as a butcher hangs meat on hooks. Shrikes then tear their prey to pieces and eat it. From this habit comes their common name of *butcherbirds*.

There are two species in North America, the *northern shrike*, or *butcherbird*, and the *loggerhead shrike*. The northern shrike ranges from the far north in summer to Kansas and Virginia in the winter. The loggerhead shrike nests in Mexico and northward to southern Canada, and travels south for the winter. Both species have feathers of gray, black, and white. Their nests are built of grass and small sticks in bushes or low trees. Both adult and young shrikes are often seen in summer on bushes, wires, and fences along country roads. The female lays four to eight eggs. They are dull or grayish white, and are thickly marked with brown and lavender.



Charles W. Schwartz

**A Young Northern Shrike** shows early evidence of the powerful bill it will develop as it grows up. The shrike is a valuable bird to man because of the insects it eats.

The northern shrike is about ten inches long. The loggerhead shrike is about an inch smaller.

Their name may be an imitation of their harsh call notes, which are screeches or shrieks. Their song, however, is a sweet warble. Shrikes are protected by law, because they destroy large insects and small mammals. L.A.H.A.

**Classification.** Shrikes belong to the family *Laniidae*. The northern shrike is *Lanius borealis borealis*; the loggerhead shrike is *L. ludovicianus ludovicianus*.

**SHRIMP.** The shrimp is a slender, fast-swimming relative of the lobster. It has a thin, translucent shell, delicate legs, and very long feelers. Its back is "humped" by the powerful muscles that move its large tail fin. Deep-sea shrimps are a brilliant red, but species fished for market have pale spotted colors much like those of the

## Eight Leading Shrimp States

Louisiana

Georgia

Texas

Florida

Mississippi

N. Carolina

Alabama

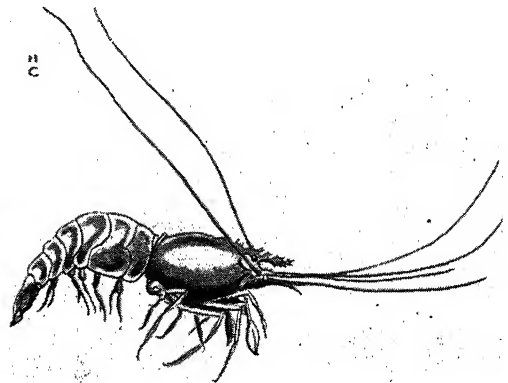
S. Carolina

Each symbol stands for 5,000,000 Pounds  
Based on Government Statistics

PICTOGRAPH CORPORATION

sandy shore bottoms over which they swim. Shrimps swim about in vast schools. They feed on ocean "small fry," alive or dead. In turn they are eaten by fishes and other sea animals. When shrimps are threatened by enemies they hide in the sand.

Shrimp fishers use nets. Shrimp fishing is carried on



**The Large Shrimp, or Prawn**, lives in the warm waters off the United States Pacific Coast and the Gulf Coast. It is much larger than the Atlantic Coast shrimp.

along the northern coasts of Europe and America, but more intensively in San Francisco Bay and Louisiana coast waters. Large shrimps are known as prawns. W.S.B.

See also ANIMAL (Where Animals Live); CRUSTACEAN; LOBSTER.

**Classification.** The three-inch common shrimp of the North Atlantic is *Crangon vulgaris*. The six-inch prawn of the south is *Penaeus setiferus*.

**SHRINE.** See MASONRY.

**SHROPSHIRE, SHRAHP** *shih*. See SHEEP (Breeds of Domestic Sheep).

**SHROVE TUESDAY** is the day before Ash Wednesday, the beginning of Lent. Its name came from the old custom of confessing (receiving *shrift*) on that day. Shrove Tuesday is a time of rejoicing in most Catholic countries. It is the *Carnival* of the Italians, the *Mardi Gras* of the French, and the *Pancake Tuesday* of the English. Similar customs are also found in Germany. See also CARNIVAL; FEASTS AND FESTIVALS (Noted Festivals); MARDI GRAS.

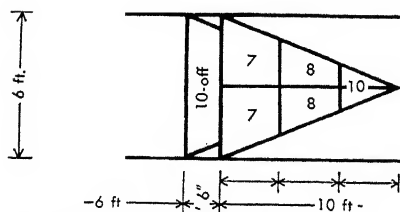
F.J.S.

**SHRUB** is the name given to a class of plants which have woody stems. They grow in almost all parts of the world. Generally, shrubs are also called bushes. They are different from vines because they stand up straight without support, and are different from herbs because they have woody tissue. Vines are creeping or climbing plants and may have either woody or herbaceous stems. Shrubs are much smaller than trees, and also usually have several stems which support the twigs and branches, while trees commonly have only one trunk. It is often difficult, however, to distinguish between shrubs, trees, and bushes.

Shrubs are very popular for planting in gardens, around the edges of lawns, and along the foundations of houses. There are many different kinds of shrubs, each with its own needs of soil, care, and climate. Many of them produce lovely blossoms or decorative leaves or twigs. Some shrubs are evergreen. Most shrubs grow fairly well in most soils, but the dirt should usually be spaded and broken at least two feet deep.

Unless the soil is too low and soggy, most shrubs can be planted in the fall as well as in the spring. The plants must be spaced to allow each to get its proper amount of food. The smaller shrubs are planted two or three feet apart, while the larger ones may be six feet apart. For the best growth and health, the shrubs are pruned carefully by cutting out the old branches and leaving room for the newer ones.

**Related Subjects.** For a list of articles on shrubs, the reader is referred to the BOTANY section of the READING AND STUDY GUIDE and to the following:



**Shuffleboard Can Be Played** in a very narrow space, providing it is long and has a smooth surface. For this reason it is

Beach Plum  
Blackberry  
Blueberry  
Cranberry

#### FRUIT-BEARING SHRUBS

Currant  
Dewberry  
Gooseberry  
Huckleberry

Loganberry  
Oregon Grape  
Raspberry

**SHRUBBY ALTHAEA**, *al THE ah*. See HIBISCUS.

**SHUFFLEBOARD** is a game in which flat wooden discs or iron weights are pushed along a board, table, or floor. The pushing is done with the hand or a long stick called a *cue*. The object is to place the weights or discs in certain squares or triangles, each numbered with a score. It is a favorite shipboard game. It is very popular in Florida and other winter resort sections.

The official game is played on a court 52 feet long and 6 feet wide. There is a scoring section marked off at each end of the court. Eight flat wooden discs, four red and four black, are used. They are shoved or moved down the court with a long cue, which has a head shaped like a half-moon.

Four discs of the same color are used by each team. The players take turns shooting them. Players try not only to place their own discs in good scoring sections, but also to dislodge their opponent's discs from good positions. An opponent's score is reduced when his disc is shoved into the forfeiting section. Fifty points constitute a game. The game is frequently adapted to smaller indoor spaces with the dimensions reduced to 28 feet by 3 feet.

E.D.M.

**SHUFU**, *shoo foo*, or **KASHGAR** (population, about 80,000), is the chief city and trading center of the Chinese province of Sinkiang. The ancient part of Shufu was once the capital of old East Turkestan.

**SHULL, GEORGE HARRISON** (1874- ). See CORN (Hybrid Corn).

**SHUNT.** See AMMETER.

**SHUNT-WOUND MOTOR.** See ELECTRIC MOTOR (Kinds of Electric Motors; illustration).

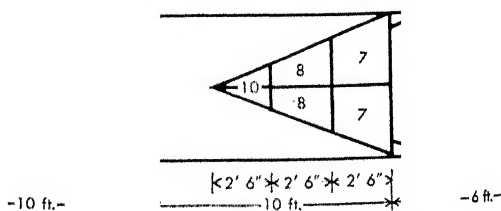
**SHUSTER, WILLIAM MORGAN** (1877- ), is an American lawyer, financier, and publisher. He was born in Washington, D.C., and attended Columbia University and Columbia Law School. After many years of public service, Shuster served from 1911 to 1912 as treasurer general and financial adviser of Persia (now Iran). In 1915 he became president of the Century Company, publishers, and he became president of the combined company of D. Appleton-Century Company in 1933.

E.E.Ro.

**SHUTTER.** See CAMERA.

**SHUTTLE.** See WEAVING.

**SHUTTLECOCK.** See BADMINTON (Battledore and Shuttlecock; illustration).



a very popular game on ships' decks, which, like the shuffleboard court itself, are long and narrow.



## SIAM

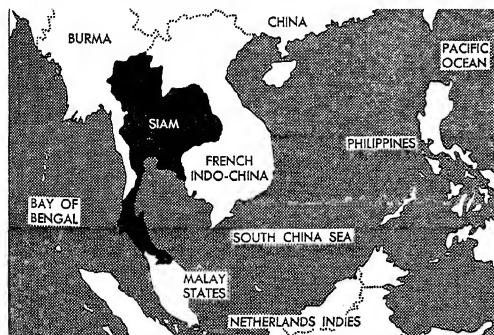
Green, Gendreau; Hurlmann, Black Star

**SIAM**, *sy AM*, lies between Burma and French Indo-China in the southeastern corner of Asia. It is often called the **LAND OF THE WHITE ELEPHANT**, because the rare white elephant is considered sacred in Siam. The Siamese call their country **MUANG THAI**, which means **LAND OF THE FREE**. Between 1939 and 1945 the Siamese Government asked foreigners to call the country **THAILAND**. Today its foreign name is once more officially **SIAM**.

Siam is the only free country in southeastern Asia. British and French colonies surround it on all sides. The King of Siam is the head of the government, but he has little power. The real rulers of the country are a few men who control the army and navy.

**Location, Size, and Surface Features.** Siam covers an area of 200,148 square miles. It is about four fifths the size of the state of Texas. The western side of Siam stretches like a long tail down the Malay Peninsula. The coast line of the country curves around the scooped-out shore of the Gulf of Siam. For the boundaries of Siam, see **BURMA** (colored map).

Siam has four natural regions. The northwestern part of the country is mountainous. In the east, a high, dry plain stretches to the Indo-Chinese border. Southern Siam is mountainous and tropical. The central part of Siam is a flat river valley. Most of the people live here.



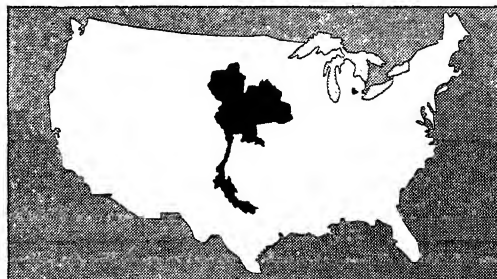
Location Map of Siam

It is a region of rice fields and open grasslands, swamps, and reed and bamboo jungles.

**Rivers.** The chief river of Siam is the Chaopaya. It flows southeastward through the country to form a low-land plain about 68,000 square miles in size. Other important rivers in southern Siam are the Mekong and Tachin. The Mekong River forms the eastern and north-eastern boundary. The Salween River separates Siam from Burma on the northwest.

**Climate.** The climate of Siam is generally warm and moist. Siam has three seasons. The cold season lasts from November to February, and the hot season lasts from the end of February until May. A rainy season starts about the first of June and lasts until the end of October.

**Natural Resources.** Siam has rich reserves of minerals. These include deposits of tin, gold, tungsten, zinc, manganese, antimony, sapphires, rubies, and coal.



Area of Siam Compared with That of the United States

Forests cover the mountain slopes in both northern and southern Siam. The northern forests include large supplies of valuable teakwood.

### The People and Their Work

**The People.** Siam has an estimated population of 15,718,000. This is a larger population than those of Texas and California put together. The Siamese people are lovers of freedom. They are descended from Mongol stock and came originally from China. Most Siamese are of medium height. They have olive complexions,

and are lighter than most Malays in coloring. Many Lao tribes live in the northern part of the country. People of the Shan, Karen, and other tribes live in the uplands. The Siamese people are not burdened with the caste system found among the neighboring Indian peoples.

Many Chinese have left crowded China to settle in Siam. The country now has about 800,000 Chinese. Most of the Chinese live in the cities. They are the businessmen of the country. There are also many East Indians and Malays in Siam.

**Agriculture.** Most of the people in Siam make their living by farming. One tenth of the country's area is cultivated. Almost all the people who live in Siam's central plain (outside Bangkok) are rice growers. Rice is the chief crop of the country, and accounts for two thirds of Siam's exports. Forty or fifty varieties of rice are grown. The method of cultivation is crude but effective. Ditches bring water into the fields. Water wheels with buckets on them carry the water from the rivers into the ditches. The rice kernels are husked by hand in a mortar, or big bowl, where the hulls are ground off with a stick, or pestle.

Rubber is Siam's second most important crop. It is grown on plantations in southern Siam. Many fruits are also grown in Siam. Other products include pepper, tobacco, hemp, maize (corn), coffee, spices, and cotton. Coconut products are important exports. Many Siamese farmers raise cattle.

**Minerals.** Many of Siam's mineral resources have not been fully developed. But tin mining has been developed by British interests in southern Siam. Siam ranks fourth among the tin-producing nations of the world.

Siamese forests are the source of another valuable export. In some years the country exports more than \$44,000,000 worth of teakwood. Elephants move the heavy teak logs to the Menam River. The wood is floated downstream for sawing and export.

**Manufactures.** Only about two persons in a hundred in Siam make their living by manufacturing. The chief manufactures include drugs, vegetable oils, hemp, silk, sugar, paper, cotton materials, and refined oil. But Siam still imports most of its manufactured products.

**Transportation and Trade.** Until recent years, the elephant, the coolie, and the oxcart were the chief means of transportation in Siam. Today modern railroads have generally replaced these primitive transportation methods. But there are still several thousand working elephants in Siam. The rivers are important highways of trade. Many of the people live on small river boats. Some boats are floating markets, which sell groceries and other wares along the crowded streams. Cattle are often used to carry vegetables to the cities to be sold.

Siam has only about 2,000 miles of paved roads. The development of commercial aviation has greatly improved transportation. Many of the inland towns have landing fields. The airport just north of Bangkok is an important stop on the British, Dutch, and French air lines which go from Europe to the Far East.

### Social and Cultural Achievements

**Education.** Siamese law requires children to go to school. At one time most of the education in the coun-

try was in the hands of Buddhist priests. But the government has built many new schools. There are also 1,300 private schools. The country's only university was founded at Bangkok in 1917.

The government's educational program emphasizes modern farming methods. All the royal monasteries, government schools, and hospitals are under the authority of the Minister of Public Instruction.

**Arts and Crafts.** Siam has an artistic tradition which goes back hundreds of years. The country has a rich store of music, but it is very different from Western music. Siamese dances are rhythmic and graceful. Typical Siamese architecture is displayed in the highly decorated Buddhist temples. The Siamese people are famous for their skill in making silver articles by a process called *repoussé*.

**Religion.** Most of the Siamese people are orthodox Buddhists. There are more than 18,000 Buddhist temples in Siam. A foreign writer once called the country the *Land of the Yellow Robe* because the 140,000 or more Buddhist priests all wear yellow robes. Siam also has many Moslems and Confucians, and some Christians.

The religious respect paid to the white elephant has played a special part in Siamese history. The Siamese flag once showed a white elephant on a scarlet ground. Many legends are told about the white elephant. One of them tells that a snow-white elephant was one of the seven gifts made to the infant Buddha. Each Buddhist temple bears the image of the elephant.

### Government

The king is the head of the Siamese government. His title is "Lord of Life and Possessor of the Twenty-Four Golden Umbrellas." For many years the Siamese kings were absolute rulers. But in the late 1800's and early 1900's Siam had progressive rulers who were sent to Europe to be educated. In 1932 a bloodless revolution took place and the royal family lost its absolute power. The king of Siam gave the country a constitution which set up a representative government.

The constitution of 1932 was replaced by a new one in 1947. It provides for a two-chamber legislature. The members of the upper house are appointed by the king, and those of the lower house are elected by the people. All men and women over twenty years old may vote. There is also a Supreme State Council of five members. The President of the State Council is the Premier of Siam. Although Siam is a limited monarchy, certain premiers have obtained such power as to make them practically dictators. There has been public agitation to make Siam a republic.

### History

**Early Years.** Historians know little about Siam before A.D. 1351. In that year the capital city of Ayuthia was founded and the supreme Siamese king came to power. The Christian world first knew Siam in the early 1500's, when Portuguese traders visited the country. In the 1600's the Siamese established trade relations with the Dutch, English, and French.

During the 1600's and early 1700's, Siam had to fight neighboring tribes to keep its independence. In 1767, Burmese forces seized Ayuthia. A time of disorder followed. In 1782 Chao P'ya Chakri took over the rule



**Siamese Market Woman, Wearing a Hat Like a Lampshade, Has a Floating Fruit Store to Serve Her Customers**



**The Spires of Wat Po, or Temple of the Sacred Fig Tree, in Bangkok, Siam**



**Siamese Logger standing by his hut on a river near Bangkok**



**dancer w**



of Siam as King Rama I. He founded the line of kings which still rules in Siam. Rama also built the modern city of Bangkok.

**The Nineteenth Century.** In the early 1800's, Siam began to expand its territories, and to strengthen friendly relations with the Western countries. In 1851 the well-educated Prince Chao Fa Mongkut was made king. He was able to bring his country into closer relationship with the outside world. During his reign, Siam was opened to the trade of all nations. Great Britain made a new treaty with Siam. This treaty established extraterritoriality. (See EXTRATERRITORIALITY.) Other powers, including the United States and most of the countries of western Europe made similar arrangements. It took Siam many years to rid itself of these treaties, which gave unfair advantage to the citizens of Western countries.

In the late 1800's, many changes took place within Siam. The country began to abolish slavery, and the schools, law courts, and army were reorganized. Railroads and irrigation systems were built.

In 1893 France demanded that Siam make neutral territory out of about a third of the country's area. Siam resisted, but the Siamese ports were blockaded and the country had to yield. Siam lost more territory to the French in 1899, 1902, and 1907. In 1909 Great Britain gained possession of 15,000 square miles of southern Siam by means of a treaty. In return, Great Britain provided money to build Siamese railroads.

**Siam in the 1900's.** Siam declared war against Germany and Austria in 1917. As a reward for Siamese help in the war, the Western countries gave up their special rights and privileges in the country. Siam was left to control its own affairs. In 1932 a group of leaders established a constitutional monarchy with the consent of King Prajadhipok.

Siam began a new period of progress. The new government started irrigation projects, fish hatcheries, and agricultural schools. But the king abdicated in 1935. He claimed that the men in power refused to give the people control of the government. His eleven-year-old nephew, Ananda Mahidol, became king.

After France was defeated in 1940, Siam demanded that certain areas in French Indo-China, including part of Cambodia, be returned to Siamese control. France refused, and Siamese forces occupied these areas by force. In 1941 Siam signed an alliance with Japan and declared war on the United States and Great Britain. The United States, however, never recognized a state of war. Japan rewarded Siam for its help by turning over portions of the Malay States and Burma to it.

But the rulers of Siam worked secretly with the Allied nations against Japan. Specially trained Allied agents entered Siam with the help of the Siamese. Siam became a listening post for the Far East. In 1945 Siam signed a treaty with Great Britain which gave the British great economic advantages. Siam continued to claim its old territories, but the United Nations refused to recognize gains made during the war. In 1946 Siam and France settled various Indo-Chinese border disputes.

In June, 1946, King Ananda died of a bullet wound. His brother, Phumiphon Aduldet, 18 years old, became King of Siam.

G.B.C.R.

**Related Subjects.** The reader is also referred to:

Bangkok	Mekong River
Buddhist	Prajadhipok
Burma (map)	Rice
Dress (Siam; color plate,	Rubber (Rubber
The Orient)	Plantations)
Flag (color plate, Flags of Asia)	

#### Questions

What name is often given to Siam? Why? What does the Siamese name for the country mean?

How is Siam different from all other countries in southeastern Asia?

In which part of Siam do most of the people live? Why?

What are Siam's three seasons during the year?

What are the country's most valuable resources?

Why have many Chinese people come to Siam?

Where do these Chinese live? Why?

What are Siam's chief crops?

For what arts and crafts are the Siamese famous?

What is the title of the king of Siam? How much power does he have?

**SIAMESE FIGHTING FISH.** See FIGHTING FISH.

**SIAMESE TWINS.** See TWINS.

**SIAULIAI.** See LITHUANIA (Cities).

**SIBELIUS**, *sih BAH'lih oos*, **JEAN** (1865- ), is a well-known Finnish composer. Many critics consider him the greatest writer of symphonies since Johannes Brahms. Sibelius, the son of an army doctor, was born at Tavastehus. He began to take piano lessons when he was nine

years old, and was soon composing music. When he was twenty, he entered the University of Helsingfors to study law, but continued to study violin and composition at the conservatory there.



Press, Pix

**Jean Sibelius** pictured his native Finland in many musical works.

In 1889 he went to Berlin for further study, and the following year he studied in Vienna. There he began writing his "Lemminkäinen Suite," which was inspired by the Finnish epic poem *Kalevala*. This symphonic poem was introduced in 1892. In that same year Sibelius wrote his tone poem, "A Saga." This was his first major orchestral work written to interpret the spirit of Finland. Sibelius taught theory for a short time at the Helsingfors Music Institute. Then the Finnish government granted him a small sum of money so that he could spend all his time in composing music.

In 1899 performances of the tone poem "Finlandia" and the *Symphony No. 1 in E minor* established Sibelius' reputation. The following year he toured Europe with the Helsingfors Philharmonic Orchestra. Later he made a number of tours of Europe and the United States. In 1904 Sibelius settled at Jarvenpää, a small town near Helsingfors.

**His Works** include the tone poems "Tapiola" and "Pohjola's Daughter"; "Concerto for Violin and Orchestra in D minor"; "Intimate Voices," for string quartet; piano, organ, and choral works, and numerous songs.

G.B.



Sovfoto

**SIBERIA**, *sy BEER ih ah*, is the name given to the vast eastern part of the Soviet Union. Siberia is neither a country nor a political subdivision. It is only the name which has long been used for the great land area of the Soviet Union which lies east of the Ural Mountains in Asia. Siberia forms the eastern two thirds of the Russian Soviet Federated Socialist Republic. This republic is the largest in the Soviet Union.

The name of Siberia once meant only terror, loneliness, and hardship. The Czars of Russia used far-off Siberia as a dumping place for hundreds of thousands of criminals and enemies of the imperial government. Both Nicolai Lenin and Joseph Stalin spent years of exile there. Many enemies of the present Soviet Government have also been sent to Siberian labor camps.

But today Siberia is a bustling pioneer land. Its great government and collective farms are growing. New cities, mines, and factories have sprung up. They are linked together by the Trans-Siberian Railway and its many branches. Siberia is a land of vast and almost untouched wealth. Much of the soil is fertile, and the Siberian forests are the largest in the world. But the climate is cold and forbidding. Siberia is much like northern Canada.

#### The Land and Its Resources

**Extent:** total area, 4,831,882 square miles. *Greatest width*, about 4,000 miles; *greatest length*, about 2,000 miles.

**Physical Features:** *Chief mountain ranges*, Ural, Cherski. Verkhoyansk, Stanovoi, Sayan. *Chief peak*, Mount Klyuchevskaya (volcano), 16,124 ft. (in Kamchatka). *Elevation*, highest 16,124 ft.; lowest, sea level. *Chief rivers*, Ob, Yenesei, Lena, Amur. *Chief lake*, Baikal. *Chief gulfs*, Ob, Anadyr, Penzhina. *Chief islands*, Novaya Zemlya, Severnaya Zemlya, New Siberian Islands, Sakhalin.

**Location, Size, and Surface Features.** Siberia lies in northern Asia. The icy waters of the Arctic Ocean border it on the north. The Bering and Okhotsk seas lie to the

east. To the south are the mountains and the deserts of Mongolia and Soviet Middle Asia. On the west, Siberia meets Soviet Europe along the line of the Urals. Siberia is almost twice the size of the United States.

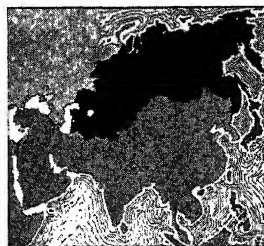
There are four different regions in Siberia. The northernmost region is known as the *tundra*. This is a land of frozen swamps, where dwarf plants, mosses, and lichens grow. The few animals found here during the long winter are typical northern species, such as the arctic fox, polar bear, reindeer, and polar partridge. Many birds come into the tundra in the springtime. Wolves, bears, and ermine follow them when summer comes.

The *taiga* lies to the south of the tundra. The taiga is a vast forest. It is the largest of the four regions, and the largest pine forest in the world. The taiga is the home of the fur-bearing animals which make Siberia one of the chief fur-producing countries of the world. Such animals as the bear, lynx, wolf, fox, sable, squirrel, and hare wander through the taiga.

The third region lies far to the south, between the taiga and the steppes. It is a continuation of the famous "black-soil" belt of Soviet Europe. The Trans-Siberian railway runs through this fertile region, and most of the people of Siberia live here.

The famous *steppes* form the fourth region. The steppes have a less fertile soil, and are used mainly for stock raising and some farming. On the south, the Siberian steppes meet the deserts of Middle Asia.

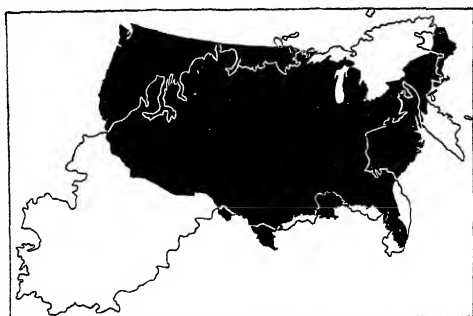
Central Siberia is bordered on the south by the Altai and Sayan mountains. The Stanovoi range of mountains extends across the east-



**Location Map of Siberia**, which is the largest division of Asia

ern end of the country. They stand highest in a mountain region that is varied only in the southeastern section by the broad valley of the Amur River.

Nowhere in the world is there such a vast, undeveloped land of such varied resources as Siberia. But the great



**Comparative Area Map of the United States and Siberia**

spaces of Siberia now are being opened up more and more by improved water, rail, and air transportation, and resources are being investigated and developed.

**Rivers and Lakes.** Siberia has great rivers which are navigable for thousands of miles. But most of the rivers flow northward into the Arctic Ocean. The winters are long and cold and these rivers freeze over. This makes navigation impossible for most of the year. The four great rivers of Siberia are the Ob, Yenesei, Lena, and Amur. These rivers and their branches form a network over the whole land.

Siberia also has a number of large lakes. Lake Baikal, with an area of 12,741 square miles, is the largest freshwater lake in northern Asia.

**Climate.** Siberia is famous for its long, cold winters. The temperature falls even lower in Siberia than it does at the North Pole. In an isolated valley of the east a temperature of  $-97.6^{\circ}\text{F}$ . was once recorded. In this savage cold the ground freezes hundreds of feet down. In the eastern third of Siberia the ground has never been known to thaw completely.

The Siberian climate is dry, as well as cold. The dryness of the atmosphere helps make the temperature seem less severe. The average temperature in the summer varies between  $50^{\circ}$  and  $65^{\circ}\text{F}$ . But there are many hours of sunshine which are favorable to a rapid growth of plant life. The rainfall is light in Siberia, except along the Pacific Coast. The summer thawing of the subsoil supplies moisture for growing plants. The lack of transportation and the scanty population have been more of a drawback to farming than the climate.

**Natural Resources.** Siberia's almost endless forests are a great source of wealth. These forests cover more than a million square miles. The Siberian lumber industry could be greatly enlarged with modern scientific methods, and if there were easier access to markets. Hunters roam the forests, trapping and killing wild animals.

Some of the Siberian soil is very fertile, and could be cultivated much more heavily than it is. Siberia is rich in minerals. Coal, iron, gold, silver, lead, zinc, manganese, tungsten, and platinum are found. One of the greatest gold areas in the world is in this northern treasure land.

## The People and Their Work

**Population:** About 14,000,000. *Density*, about 3 persons per square mile.

**Chief Products:** *Agricultural*, wheat, oats, rye, cattle, horses, butter. *Mineral*, gold, silver, coal, iron, lead, zinc, manganese, tungsten. *Manufactured*, flour, leather, and a great variety of other products.

**The People.** Siberia has a population slightly larger than that of Canada. The population of Siberia has grown considerably since World War I. But large areas are still almost uninhabited, especially in the vast Arctic section of the north.

Siberia has few towns or cities. Most of the people are either immigrants or the children of immigrants. The people are mostly Russians of the peasant class. Some were established in colonies by the government of the czars. Others came to Siberia voluntarily, especially under the encouragement of the Soviet Five-Year Plans. Other settlers are political exiles.

Most of the settlements are along the rivers and railroads. Large cities have grown up where the rivers and railroads cross. The population in the remote areas is made up largely of native Mongoloid people.

**Agriculture.** Siberia is chiefly an agricultural country. The best farming district is confined to the narrow black soil belt, but it will probably be many years before other industries become more important than farming, in any part of Siberia. All farming is under direct government supervision, and much of the work is mechanized.

Wheat, oats, and rye are the chief crops. Other crops include potatoes, beets, peas, beans, barley, flax, various grains, and fiber plants. Strawberries, blackberries, raspberries, and cranberries grow in great quantities in Siberia.

**Livestock Raising** is the chief industry of the people who live on the steppes. Horses, cattle, goats, reindeer, and camels are raised. There is plenty of grazing land, but the soil is not so well suited to farming as the land in the black-soil belt. The only drawback is the need of feeding and sheltering the cattle during the severe winters.

**Dairying** is an important industry. Trainloads of butter in refrigerator cars are sent westward from Siberia into Soviet Europe. The Siberian butter industry has always been managed by peasant co-operative societies.

**Manufactures.** Home industries made up the largest part of Siberian manufacturing for many years. The chief manufacturing plants were flour mills, breweries, sugar refineries, and tanneries. But the Soviet Government has built up many new industries in Siberia. Transportation has been improved, and modern machinery and skilled workmen have been brought in. Heavy industry has increased enormously, for Siberia is a storehouse of raw materials, and has the necessary water power to operate many industries.

**Minerals.** Many Siberians earn their living in the mines. Metals of nearly all kinds are mined. Large plants have been built to process Siberia's vast supply of iron ore. Siberia has some of the world's largest coal deposits. The iron fields of the Urals and the coal of Kuznets have been linked by the Soviets into a remarkable system of modern mines and giant factories known as the *Ural-Kuznets Combinat*.



**A Siberian Hunter in Tunguska Returns** with his bag of grouse, and a prospective customer inspects the birds before

buying. As in Lapland, reindeer pull sledges over the deep snow and provide food and clothing for people of the area.



**A Construction Worker** on the Trans-Siberian Railway inspects a switch signal.



**Fishing is an Important Industry** on the coast of eastern Siberia. These fishermen are hauling in a net of herring from cold, deep waters.

Photos: Sovfoto

The Soviet Union ranks second among the gold-producing nations of the world, and most of this gold is mined in Siberia. The mines along the Kolyma, Aldan, and Yenesei rivers produce most of the gold from Siberia. The introduction of electric dredges and other modern mining equipment has greatly increased gold production. Railroads and seaports have been developed to improve the shipping of ores and minerals.

**Fisheries.** Fishing is an important industry, but it is also in need of better transportation and more modern methods. This is especially true in the waters of the Soviet Far East, where the Japanese had certain fishing rights. These rights caused many disputes between Moscow and Tokyo before World War II. Lobsters, crabs, salmon, cod, and herring are the principal fish of commercial value.

**Transportation and Trade.** The Trans-Siberian Railway connects Vladivostok with Moscow and Leningrad. Irkutsk, on Lake Baikal, is a trading center where several caravan routes from China connect with the Trans-Siberian Railway. This railroad is Siberia's most important commercial route. It had greatly aided farming and manufacturing, and the general development of the country. All the traffic of the great Siberian rivers is carried toward the railroad and numerous commercial and industrial centers have been developed along the line. See TRANS-SIBERIAN RAILROAD.

A Turkestan-Siberian railroad 906 miles long was opened in 1930. Several passenger and freight air lines are now in operation. Ancient caravan routes once led from the chief Siberian cities to the cities of Manchuria and Mongolia, and goods were transported over them on the backs of camels and horses. Automobile roads now follow these routes. Unfortunately, gasoline must be brought all the way from the Caspian Sea, or from Sakhalin Island. Siberia has a network of telegraph lines and also well-developed communication by radio.

Long before railroads were built, travelers crossed Siberia by water. The chief rivers of Siberia flow northward, which is the wrong direction for travel and trade. But their branches form interlocking east-west waterways and it is possible to cross from one major basin to another by a short overland journey, or portage. In this way a traveler can go by water all the way from the Volga in Soviet Europe to the Amur on the Pacific Coast.

The difficulty of transportation caused by the freezing of the northern ports is being overcome by the work of the Northern Sea Route Administration. The Soviet Government has built a network of radio and weather stations across Siberia. Seaplanes are also used for supply and communication. With the help of these modern methods, Soviet vessels as well as ships from England, Sweden, and other nations are able to navigate the Arctic waters during at least two months, August and September. Even in this very short season, a great amount of goods can be transported over the Northern Sea Route, and carried down to the mouths of the Siberian rivers.

**Cities.** The chief cities of Siberia are described under their own names or in the article UNION OF SOVIET SOCIALIST REPUBLICS, in THE WORLD BOOK ENCYCLOPEDIA.

## Government

Siberia lies in the eastern part of the Russian Soviet Federated Socialist Republic, which is one of the divisions of the Soviet Union. Within Siberia itself are two republics and several *krai*, or administrative regions, and other areas with varying classifications. The republics are the Autonomous Soviet Socialist Republics of Yakutsk and Buriat-Mongol. They are governed by their own *Presidium* and *Council of People's Commissars*.

The other principal divisions are known as the Western Siberian, Krasnoyarsk, and Far Eastern Areas. The widely separated settlements in these divisions are governed by local soviets or councils. The government of the whole area is directed by the *Presidium* of the *Russian Soviet Federated Socialist Republic*. All Siberia is under the control of the central Soviet Government at Moscow. See UNION OF SOVIET SOCIALIST REPUBLICS (Government).

## History

**Early History.** Siberia was a remote and almost unknown land until fairly recent times. The known history of Siberia probably began with the migrations of people who were driven northward by the Mongols or Tatars. Small principalities grew up in Siberia, but wandering Turkish tribes soon attacked the people in these settlements. The Turks were cruel, but made some pretense of civilization in the empire they set up.

Then came the terrible days of Genghis Khan. This Mongol warrior included some of the unfortunate Siberian peoples in great conquests of the early 1200's, and destroyed what civilization they had built up. Three hundred years passed before a Tatar state with a capital at Sibir asked to be recognized by the Russian government at Moscow. The request was refused.

**Beginning of Russian Control.** The first extension of Russian power into the faraway regions of Siberia was made at the time of the Cossack adventurer Yermak. Yermak gathered a small band of Russians and Cossacks and led them eastward into Siberia. In 1581 he defeated the Tatars and captured Sibir. Yermak was drowned five years later, but not before he had won the beginnings of a huge new Russian empire in the east.

More and more Russians invaded Siberia. Fifty years after Yermak died, the Russians found their way across the vast empty plains and reached the Pacific Ocean. In the 1600's they attempted to extend their power into the Amur River region, but the Manchu emperors of China resisted their efforts.

In 1689 Russia signed a treaty with the Manchus which ended Russian claims to the northern side of the Amur. Almost 200 years passed before Russia made an attempt to regain possession of this area. In 1858 a treaty between Russia and China made the Amur River the boundary between the two countries. Two years later the feeble Chinese Government gave up more territory to Russia. This extended Russian territory to the coast. Russia was thus able to build Vladivostok, which became its most important port on the Pacific. It is still the chief Pacific naval base of the Soviet Union.

Peter the Great sent the first political prisoners to Siberia in 1710. This practice soon made Siberia known



throughout Russia as a land of suffering, sorrow, and dreary frozen wastelands. Later, hundreds of thousands of murderers, thieves, and other criminals were sent there as convicts and settlers. But criminals proved to be poor material for pioneers.

Many Russian peasants went willingly to Siberia to work in the gold mines. Many of these workers settled near the mines. The imperial government began to encourage immigrants who were willing to settle in Siberia, in order to offset the large numbers of Chinese who were coming in from the south.

**Siberia in the 1900's.** The Trans-Siberian Railway was first planned as an aid to colonization. By 1900 Russia had secured a foothold in the Liaotung Peninsula of southern Manchuria, and a naval station was built at Port Arthur. Port Arthur was later connected with the Trans-Siberian Railway and became a powerful Russian base. Still later Japan seized the port in the Russo-Japanese War of 1904-1905.

The Russian imperial government collapsed in 1917, and the empire fell apart into warring groups. By the end of the year there was fighting throughout Siberia between Czarist groups and the Bolsheviks, who were setting up the new Soviet government. Siberia's location, and its political contacts with Japan, China, and the United States created problems quite different from those which Russia faced in the west. There was a strong movement to separate Siberia from the Moscow government.

But the movement was put down, and western Siberia was made a part of the Russian Soviet Federated Socialist Republic. The Far Eastern territory formed an independent republic, but by 1922 that, too, was absorbed by the R.S.F.S.R.

Siberia became very important to the Soviets during World War II. Large supplies of goods and ammunition used on the German front came from Siberia. Many Soviet industries were moved east of the Ural Mountains to protect them from German attack. Entire factories were dismantled and moved to Siberia. Toward the close of the war, Siberia became the base for the Soviet attack on the Japanese in Manchuria. G.B.CR.

**Related Subjects.** The reader is also referred to:

Aquamarine	Trans-Siberian Railway
Arctic	Tundra
Kamchatka Peninsula	Union of Soviet Socialist Republics
Steppe	

#### PHYSICAL FEATURES

Amur River	Ural Mountains
Baikal, Lake	Yablonoi Mountains
Lena River	Yenisei River
Stanovoi Mountains	

#### Questions

For what purpose was the territory of Siberia used for many years?

What are the four separate regions of Siberia? How are they different?

What are Siberia's chief farm crops?

How can a traveler cross Siberia from east and west by water?

Who sent the first political prisoners into Siberia? When? Why have many people willingly moved into Siberia?

How was Siberia important to the Soviet Union during World War II?

**SIBERIAN HUSKY.** See Dog (color plate, Working Dogs); ESKIMO DOG.

**SIBLEY, HENRY HASTINGS.** See MINNESOTA (Famous Minnesotans).

**SIBYL, *SIB il*,** was the name given in Roman times to any aged woman who could foretell the future. The best known is the Cumaean Sibyl. King Tarquin the Proud refused twice to buy her nine books of prophecies, and each time she burned three of them. Finally he bought the last three for the price she had asked for all nine of the books.

These three books were destroyed when the temple of Jupiter was burned in 83 B.C. The rulers ordered all sibylline verses to be brought together from all over the Greek and Roman world. They placed them in the new temple of Jupiter on the Capitoline Hill in Rome. People read the sibylline verses when they wanted to learn how to make peace with the gods. P.CO.L.

**SICILIES, *SIS ih liz*, KINGDOM OF THE TWO.** This was the name of an early kingdom of Italy. It included the island of Sicily and a large part of southern Italy. The capital was at Naples, and the kingdom was sometimes called the *Kingdom of Naples*.

The kingdom was first formed by Northmen who traveled southward and invaded Sicily about the same time that William the Conqueror invaded England.

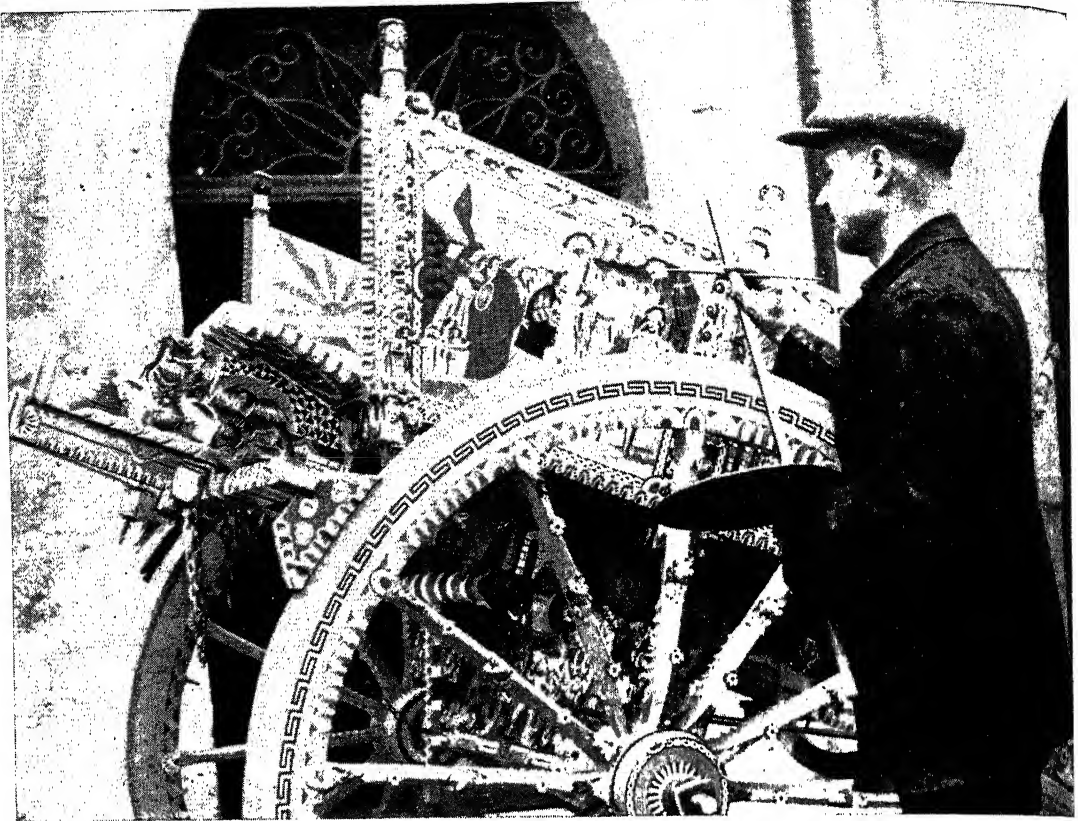
In 1266 the Two Sicilies came under French rule. In 1282 a great uprising took place in Sicily, known as the Sicilian Vespers, which resulted in the massacre of nearly all the French on the island. Sicily was later separated from Naples and made a province of Aragon, Spain. Spanish rule was harsh, and there were continual revolts and assassinations. In the War of the Spanish Succession in 1713, Austria seized Naples, and Sicily was given to Savoy. Savoy turned Sicily over to Austria in 1719, in exchange for Sardinia.

In 1734 the Two Sicilies were conquered by Spain, and were ruled by the Spanish Bourbon family until the time of Napoleon. King Ferdinand I joined the allies against France and lost Naples as a result. The two parts of the kingdom were reunited after Napoleon's downfall.

The Kingdom of the Two Sicilies played an important part in the movement for a united Italy. In 1820 there was an uprising in Naples of the Carbonari, a secret nationalist society. King Ferdinand was forced to grant the Neapolitans a constitution but then called for aid from Austria. An Austrian army invaded Naples, and restored Ferdinand to absolute power. In 1848 King Ferdinand II suppressed another uprising with savage cruelty.

In 1860 Giuseppe Garibaldi and his Expedition of the Thousand landed at Marsala, on the Sicilian coast. They soon conquered all of Sicily. Garibaldi then invaded the mainland and marched on Naples. On his way he was joined by thousands of patriotic Neapolitans. King Francis II fled, leaving the entire kingdom in the hands of the patriots. A plebiscite was held and the people approved the unification of Italy by a large majority. In 1861 the Kingdom of the Two Sicilies was abolished and its territory became part of the Kingdom of Italy. J.S.S.

See also ITALY (Government and History); NAPLES; SICILY.



Körte, Black Star

**A Masterpiece of Combined Arts** of the cartmaker, the wood carver, and the painter receives its finishing touches by an artist at Palermo, Sicily. The paintings on the sides of the cart are traditional religious scenes. Delicately carved figurines

decorate the posts and corners of the cart body. Even the wheel spokes have carved and painted figures and flowers. The colors are gay and brilliant. Many hundreds of man-hours went into construction of the vehicle.

**SICILY** (in Italian, *SICILIA*) is a large Italian island in the Mediterranean Sea. In prehistoric times, Sicily was part of the mainland of Italy. Today it is separated from the toe of the Italian boot by the narrow strip of water called the Strait of Messina.

Because of this strait, Sicily had an early separate history from that of Italy. Early Carthaginians, Greeks, Romans, and Saracens invaded the island and added their share to Sicilian civilization. But the Strait of Messina kept the barbarian hordes from overrunning Sicily when they destroyed the Roman Empire.

**Location, Size, and Surface Features.** Sicily covers an area of 9,926 square miles. It is a little larger than

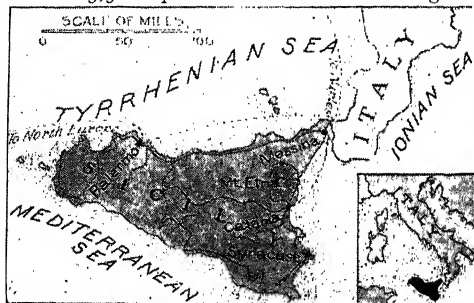
the state of New Hampshire. For the boundaries of Sicily, see *ITALY* (colored map).

The Apennine Mountains run the length of the Italian mainland and cross Sicily from east to west. Most of the island is mountainous. Its highest point is Mount Etna (10,740 feet). See *ETNA, MOUNT*.

Sicily has many earthquakes. These are especially severe near the Strait of Messina. Geologists believe that the earthquakes are connected with volcanic activity in Mount Etna. Earthquakes have twice destroyed the city of Messina.

Sicily may be divided into three natural regions. These slope to the sea north, east, and south of the mountains. The richest section of the island is the interior upland which makes up part of the northern slope. The chief city, Palermo, lies on a shallow harbor along the northern coast. The eastern shore of Sicily has been famous for its beautiful cities since the days of the ancient Greeks. Catania, Syracuse, and Taormina are all located here. The southern coast is a broad plain which is flat near the coast and hilly as it rises toward the uplands. This coast is sandy and has no good harbors. It is the driest and least productive part of Sicily.

The rivers of Sicily rise in the mountains and flow southward and eastward toward the sea. They fill their beds for only a short season in the winter, and are al-



Location Map of Sicily, in Relation to Italy

most dry in the summer. The Salso and Simeto rivers are the largest.

**Climate.** During the winter, the coasts of Sicily have a mild climate that attracts many tourists. The highlands in this season are unpleasantly rainy. In the summer the highlands are pleasant, but the coastal plains are dusty and hot. The sirocco, a hot, damp wind which blows over from the Libyan Desert of Africa, is especially bad on the southern coast of Sicily.

**Natural Resources.** Volcanic ash makes the land of eastern Sicily very fertile and many people live in that region. Sicily's mountains have deposits of several minerals. The most important of these is sulfur. The waters off the coast are rich in fish of many kinds.

**The People.** Sicily has a population of 4,256,077—more than 400 persons to the square mile. The Sicilians are much like the Italians, and their language is Italian. They are often described as fierce, emotional, and independent.

**Farming and Fishing.** Most of the people earn their living by farming and fishing. The seas around Sicily yield great quantities of tunny, sardines, coral, and sponges. The chief agricultural products of the island are olives, oranges, lemons, grapes, wheat, and winter vegetables. Southern Sicily requires irrigation to produce crops. Most of the land is owned by great landlords. Many of these landlords do not live in Sicily. The people are poor, partly because there is not enough rainfall to grow good crops, and partly because the affairs of the island have been badly managed.

**Cities.** Syracuse and Palermo, the largest city of Sicily, are described under their own names in THE WORLD BOOK ENCYCLOPEDIA. Other important cities are described below.

**Catania,** *kah TAH nyah* (population 244,972), is Sicily's second largest city. It lies on the eastern coast of the island on the Gulf of Catania, between Mount Etna and the sea. At different times, earthquakes and volcanic eruptions have partly or wholly destroyed the city. Catania is very old, and was a place of importance in Roman times. It is one of the chief ports of Sicily.

**Messina,** *meh SE nah* (population 192,051), is the third largest city in Sicily. It lies on the northeastern coast of the island, on the Strait of Messina. Messina is an important trading center and is noted for its exports of fruit, wine, fine silk, linen, and damask.

Historians believe that pirates founded the city in the 700's B.C. About 500 B.C. it was a well-known Greek colony. The Greeks gave Messina its name. The First Punic War was fought over Messina. At the end of this war, the colony fell into Roman hands. After Rome fell, Messina belonged in turn to the Saracens, Normans, Hohenstaufens, and Spaniards. The city has been part of Italy since 1861. Messina suffered in many wars and several earthquakes. It was completely destroyed by an earthquake in 1908, but was soon rebuilt into a modern, beautiful city.

Greek, Roman, and Renaissance ruins are found in many places in Sicily. Taormina, in eastern Sicily, has a Greek theater and other monuments which bring thousands of tourists to the town.

**History and Government.** Sicily lies between Europe and Africa and has for many years been a battlefield for the two continents. The first settlers in Sicily probably came from Italy. They were conquered by the Greeks, who founded the colonies of Syracuse, Agri-

gentum, Naxos, and others. The Greeks brought their culture to the island.

Sicily was in turn invaded by forces from Phoenicia, Carthage, and Rome. The Goths and Vandals from the north drove the Romans out of Sicily. They themselves were driven out when Belisarius conquered the island and made it a part of the Byzantine Empire. Byzantine rule gave way to that of the Saracens from North Africa. The Normans became rulers of the island when Sicily became a part of the Kingdom of the Two Sicilies. (See SICILIES, KINGDOM OF THE TWO.) After a long period of Spanish and Austrian control, Sicily became part of the new united Italy in 1860.

During World War II, American, British, and Canadian troops landed on the southeastern coast of Sicily. The conquest of Sicily was completed when Messina fell on August 16, 1943. Sicily then became a springboard for the invasion of southern Italy. H.V.B.K., JR.

See also DRESS (Italy); ITALY; MAFIA; MESSINA, STRAIT OF; PALERMO; SYRACUSE.

**SICKLE.** See REAPING MACHINE.

**SICK MAN OF EUROPE.** See TURKEY (The Nineteenth Century).

**SIDDAL, SID'el, ELIZABETH ELEANOR** (d.1862). See ROSSETTI, DANTE GABRIEL.

**SIDDHARTHA,** see DAHR t'hah, **PRINCE,** was the original name of Gautama Buddha, founder of Buddhism. See BUDDHA; BUDDHIST.

**SIDDONS, SID unz, SARAH KEMBLE** (1755-1831), was the most famous English actress of her time. She was born in Brecon, Wales, and was married to William Siddons, an actor, when she was eighteen years old. Together they played in shows in country towns.

Mrs. Siddons first became famous in 1774 when the nobility applauded her Belvidera in *Venice Preserved*. They had expected to ridicule her performance. David Garrick was then persuaded to give her a part in one of his plays at the famous Drury Lane Theater in London. This engagement proved a failure, but in 1782 Garrick called her back to play the part of Isabella in *Fatal Marriage*. In this role she made an outstanding success. Her striking figure, brilliant beauty, and stately carriage made her especially excellent in such classic roles as Lady Macbeth and Queen Catherine in Shakespeare's *Henry VIII*. B.M.

**SIDEREAL, sih DEER ee al, TIME** is star time. It is measured by the rotation of the earth in relation to the stars. Sidereal time measures the actual spin of the earth, separate and apart from its orbital rotation about the sun. Our familiar sun time, generally used on clocks, measures the time from noon to noon. Owing to the earth's revolution in its orbit, the sun rises nearly four minutes later each day as measured by the stars. A sidereal day equals 23 hours, 56 minutes and 4.091



Brown Bros.

**Sarah Siddons** was one of the best-known stars of the English stage.

seconds of mean solar time. Conversely, a mean solar day equals 24 hours, 3 minutes and 56.555 seconds of sidereal time. The result is that there are approximately  $366\frac{1}{4}$  sidereal days in a year.

Sidereal time is observed with an instrument called a *transit telescope*. Every star in the sky has a position number, called its *right ascension*, and when that star touches the central wire in the transit telescope its right ascension number is the time for that instant on the sidereal clock. "Noon" of sidereal time is the place where the sun crosses the equator coming north. It is called the "first point of Aries," and its symbol is  $\Upsilon$ . See also DAY. O.J.L.

**SIDERITE**, *SID* or *ite*. See CARBONATE; IRON AND STEEL (Kinds of Iron Ore).

**SIDESADDLE FLOWER**. See PITCHER PLANT.

**SIDE SHOW**. See CIRCUS.

**SIDING**. See CARPENTRY (Siding).

**SIDNEY, ALGERNON** (1622-1683). See RYE HOUSE PLOT.

**SIDNEY, PHILIP, SIR** (1554-1586), was a talented courtier, traveler, poet, and soldier who was a popular idol during part of the reign of Queen Elizabeth. He is remembered for his *Apologie for Poetrie*, a critical essay in prose; *Astrophel and Stella*, a series of love sonnets; and *Arcadia*, a long pastoral romance.



Brown Bros.

**Sir Philip Sidney**, brilliant member of Queen Elizabeth's court

Sidney was born at Penshurst, Kent, the eldest son of Sir Henry Sidney and a nephew of the Earl of Leicester, a favorite courtier of Queen Elizabeth. Sidney was favorably received by the queen, who gave him several important foreign missions. Later Elizabeth dismissed Sidney because of his objection to her proposed marriage with Henry, Duke of Anjou, but a few months later she called him back. Sidney was greatly interested in the colonizing projects of Martin Frobisher, Richard Hakluyt, and Sir Walter Raleigh. He also wanted to sail with Sir Francis Drake against the Spaniards, but the queen would not let him, saying that she could not spare "the jewel of her dominions."

Sidney urged Elizabeth to make war on Spain, and he took part in the fighting. During the war, while acting as governor of Flushing, in The Netherlands, Sidney was fatally wounded at the Battle of Zutphen.

Sidney's untimely death was widely mourned. His body was taken to England and buried with public ceremony in Saint Paul's Cathedral. Sidney's writings were not published until after his death. J.Au.

**SIDON**, *SI dahn*. See PHOENICIA (Cities).

**SIEGE**, *seej*. This word comes from the Latin *sedere*, meaning to sit. Literally, a siege consists of stationing an army before a defended place for the purpose of taking it by assault or of starving it into surrender.

The first object of the besieging force is to surround,

or *invest*, the position, so as to keep outside help or supplies from reaching the besieged. Artillery is placed at important and commanding positions, and the attackers advance to the assault either openly or from trench to trench. The digging of the trenches is usually difficult and dangerous, and must be carried on under cover of artillery and rifle fire, or at night.

**Modern Siege Methods**. Modern siege tactics have undergone considerable change since the Russo-Japanese War. Special siege guns are used in reducing a city by artillery fire, or bombardment. These guns are more powerful than those used by an army in the field.

For siege purposes, 8-inch howitzers, mortars, and long 6-inch guns have been adopted. The big siege guns introduced by the German army during World War I had an effective range far greater than any previously known gun. In World War II, the German army introduced guns of even longer range which fired across the English Channel from France into England. Jet-propelled airplanes and rocket bombs were introduced by the German army in World War II during the battle of Britain, which was a siege by air.

The success of long-range guns used by the German army in World War I led to the conclusion that a well-protected position could eventually be battered into submission. However, this theory was weakened during World War II when it was demonstrated that a modern city, with its many strong buildings and underground cellars and passages, can resist siege.

**Famous Sieges**. When a defending force succeeds in beating off an attack, the siege is said to have *held*. A siege is *relieved* when outside reinforcements come to the rescue of the defending force. When the attacking force is victorious, the position under siege is said to have *fallen*. Among the greatest recorded sieges are the following:

- 1200 B.C.—Troy, ten years. Fell.
- 1428-1429—Orleans, seven months. Relieved by Joan of Arc.
- 1779-1783—Gibraltar, three years, seven months, fifteen days. Held.
- 1855—Sebastopol, 316 days. Fell.
- 1857—Delhi, 132 days. Relieved.
- 1857—Lucknow, 141 days. Relieved.
- 1862-1863—Vicksburg, 186 days. Fell.
- 1864-1865—Richmond, 287 days. Evacuated.
- 1870—Metz, 70 days. Fell.
- 1870-1871—Paris, 130 days. Fell.
- 1877—Plevna, 144 days. Fell.
- 1899-1900—Ladysmith, 118 days. Relieved.
- 1904-1905—Port Arthur, 241 days. Fell.
- 1912-1913—Adrianople, 155 days. Fell.
- 1914-1915—Przemysl, 185 days. Fell.
- 1916—Verdun, 298 days. Held.
- 1936—Alcazar, 71 days. Relieved.
- 1941-1942—Leningrad, 455 days. Relieved.
- 1942-1943—Stalingrad, 166 days. Relieved.
- 1945—Berlin, 14 days. Fell.

R.Col.

**Related Subjects**. The reader is also referred to:

- |                         |                           |
|-------------------------|---------------------------|
| Balkan Wars (First War) | Sepoy Rebellion           |
| Boer War                | Spain (Spanish Civil War) |
| Crimean War             |                           |
| Franco-German War       | Troy, or Ilium            |
| Gibraltar               | War between the States    |
| Hundred Years' War      | World War I               |
| Joan of Arc, Saint      | World War II              |
| Russo-Japanese War      |                           |

**SIEGE PERILOUS.** See **ROUND TABLE**.

**SIEGFRIED**, *SEEG* freed, is the hero of several German legends. His story is best known from the music-dramas of Richard Wagner. Siegfried is the hero of two of these, *Siegfried* and *Die Götterdämmerung*. In Wagner's



From "Myths and Legends of All Nations" by Logan Marshall, published by John C. Winston Co.

**The Legendary German Hero, Siegfried**, kills an enemy in combat, with a blow of the great sword he has forged.

operas Siegfried forges a great sword from the broken one of his father, Siegmund. He kills a dragon with this weapon, and wins the magic ring and the cloak of Tarnhelm. This makes him unbeatable in battle. He frees Brünnhilde, the Valkyrie daughter of Wotan, from enchantment and marries her. He is cast into a spell by the plotting of Hagen, and aids Gunther in marrying Brünnhilde. Siegfried marries Gutrune (Gudrun), Gunther's beautiful sister, while still under the spell. He is killed by Hagen while he is off guard after coming out of the enchantment. See also **OPERA** (Some of the Famous Operas [Nibelungen Ring]). K.N.

**SIEGFRIED LINE**, or **WESTWALL**. This chain of steel forts and concrete tank barriers extended along the border between Germany and France. It was opposite the Maginot Line, a similar fortification built by France. The Siegfried Line was completed under the supervision of Adolf Hitler, Nazi dictator, in 1938. The Siegfried Line, like the Maginot Line, was supposed to be impossible to pass. But it yielded in many places to Allied tank and artillery attacks during World War II. It was destroyed by Allied occupation forces after the war. See also **MAGINOT LINE**.

**SIEMENS**, *ZEE* menz, **WERNER VON** (1816-1892), and **WILHELM** (1823-1883), were German inventors and industrialists. The two brothers founded a great steel and electrical industry with branches throughout Europe. They pioneered in applying electricity to such new fields as telegraphy, railways, lighting, and manufacturing processes.

Both the brothers were born in Lenthe. Werner went to a military school and at seventeen joined the Prussian army. Wilhelm studied at a commercial school. Both learned engineering by practical experience in factories. When Werner was twenty-five, he invented an electroplating process, and Wilhelm took it to England to sell. He finally settled in England and became known as Sir William Siemens. Later Werner invented a dynamo with which Wilhelm ran railways. They both took part in laying the first telegraphic cable across the Atlantic Ocean. J.COT.

**SIENA**, *SYEH* nah, **CATHEDRAL**. See **CATHEDRAL** (Most Famous Medieval European Cathedrals).

**SIENA HEIGHTS COLLEGE** is a Catholic women's school in Adrian, Mich. Courses are offered in the liberal arts and sciences. The college was founded in 1919 as St. Joseph's College and given its present name in 1938. It has an average enrollment of about 200. SR.B.M.

**SIENKIEWICZ**, *shen* KYA vich, **HENRYK** (1846-1916), was a Polish novelist. His best-known work is *Quo Vadis?*, a story of ancient Rome in Nero's time. Sienkiewicz could vividly portray history scenes and characters, and his stories have suspense and emotional power.

He was born in the province of Siedlce. After he attended the University of Warsaw, he visited California. His first work was a series of letters about his trip, which was published in the *Polish Gazette*.

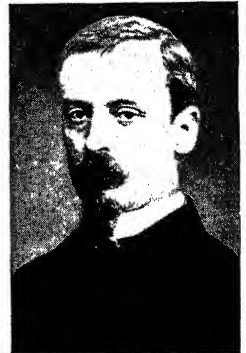
The first of his popular novels, *The Tatar Bondage*, was published in 1880. His next work was a trilogy about the struggle between the Poles and Cossacks. He won the Nobel prize for literature in 1905, the year after his *Knights of the Cross* was published. L.J.

See also **NOBEL PRIZES**.

**His Works** include *With Fire and Sword*; *The Deluge*; *Pan Michael*; and *Children of the Soil*.

**SIERRA LEONE**, *sih* ER ee lee O nee, is a British colony and protectorate on the western coast of Africa. The country is south of French Guinea, and north of Liberia. A group of Englishmen established a settlement on this coast in 1788 for Negroes who had been liberated from slavery in England and, after 1807, for other Negroes who were rescued from slave ships. Sierra Leone later became a possession of the British Government, and in 1896 a large region around the original settlement was proclaimed a British protectorate.

The colony is a strip of land which extends inland about 20 miles. It covers an area of about 2,500 square miles and has an estimated population of 121,100. The



Brown Bros.

**Henryk Sienkiewicz**, Polish author, wrote *Quo Vadis?*, a novel.



boundaries of the protectorate extend inland for 180 miles. The protectorate covers an area of 27,669 square miles, and has a population of about 1,672,000. The colony is the seat of government for the entire Sierra Leone region. Freetown (population 86,000) is the capital of Sierra Leone and the most important seaport in West Africa.

Sierra Leone is a hilly land covered with dense brush and jungle and large areas of tropical forests where teak, ebony, and rosewood trees grow. The climate is hot and wet all through the year. Sierra Leone was once widely known and feared as "the white man's grave." Today medical science and improved sanitation have conquered tropical diseases, but there are only about a thousand white men living in the country. The native peoples are governed by tribal chieftains and produce most of the necessities of their lives without much outside assistance. There are 337 miles of narrow-gauge railroads built to bring to Freetown the palm oil, palm kernels, kola nuts, and ginger that are produced in the interior of Sierra Leone for shipment to foreign countries.

H.V.B.K., JR.

See also AFRICA (map); FREETOWN.

**SIERRA MADRE**, *MAH dray*, means the "Mother Range" in Spanish. It is the name given to a number of mountain ranges in Spanish-speaking countries. The Sierra Madres of Mexico form the edge of the wide central plateau of Mexico. Toward the Gulf of Mexico, on the east side of the plateau, is the Sierra Madre Oriental (east). The west side of the plateau is bordered by the Sierra Madre Occidental (west). Its canyons and deep deposits of volcanic material make the plateau very difficult to cross. The range is 2,000 miles long and more than 100 miles wide. Part of the Sierra Madre Occidental extends into Arizona and New Mexico. Sierra Madre is also the name of mountain ranges in Spain and on the island of Luzon in the Philippines.

M.U.

**SIERRA NEVADA**. See SPAIN.

**SIERRA NEVADA** is the name of the highest and steepest mountain range in the United States. It extends north and south through eastern California for more than 400 miles. To the west of the range are the valleys of the Sacramento and San Joaquin rivers, and to the east lies the Great Basin. Mount Whitney (14,496 feet), the highest peak in the United States proper, belongs to the Sierra Nevada range. The range contains many other peaks more than 10,000 feet above sea level. Among the places in the Sierra Nevada famous for beautiful scenery are the Yosemite Valley and Lake Tahoe. See also CALIFORNIA (Location, Size, and Surface Features [The Sierra Nevada]); YOSEMITE NATIONAL PARK.

L.D., JR.

**SIESTA**, *sih ES tah*. See MEXICO (Siesta).

**SIEVE TUBE**. See STEM.

**SIEYÈS**, *syay YES*, **EMANUEL JOSEPH** (1748-1836), was a leader of the French Revolution. He was one of the great minds behind the Revolution and the author of the famous booklet *What is the Third Estate?*

Sieyès was born at Fréjus, and was educated for the priesthood. He became a priest in Brittany, but was in Paris during the Revolution. Sieyès was a member of the States-General in 1789. He suggested the creation of the National Assembly, and was elected its president in 1790. He took such a silent, secret part in the events of

his time that Maximilien Robespierre called him "the cunning fox of the Revolution." Sieyès did not agree with the leaders of the "Terror." During the bloody period which followed, he became almost a silent member of the Assembly. Later he was asked what he had done during the Terror. "I have survived," was his answer.

Sieyès was ambassador to Berlin in 1798. The next year he was elected to the Directory and helped to make Napoleon I the first consul of France. He also formed what was called a consulate. Sieyès and Napoleon were members. But no man could oppose the will of Napoleon. Disagreements arose and Sieyès retired with a gift of \$120,000, an estate, a seat in the Senate, and the title of Count of the Empire. He was exiled when the Bourbon kings returned to France.

A.M.

**SIF**, *sif*. See THOR.

**SIGEBERT**, *ZE geh bert* (535-575). See BRUNHILDE.

**SIGH**, *sy*. A sigh is a single long breath. It may be a long inspiration followed by a long expiration. It may also be a long inspiration followed by a hard short expiration. The sigh may vibrate the vocal cords and sound the voice, or it may not. A sigh seems to be a reflex, that is, an action that is not voluntary. Scientists can explain why we cough or sneeze, but they are not sure of the reasons for yawning, hiccupping, or sighing. A sigh may be a sign of exhaustion. Sighing also seems to have some connection with the emotions, for it is often a sign of worry, grief, or relief. People sometimes sigh purposely to show these emotions.

A.B.H.

**SIGHS, BRIDGE OF**. See BRIDGE OF SIGHS.

**SIGHT BILL**. See BILL OF EXCHANGE.

**SIGILLARIA**. See SATURNALIA.

**SIGISMUND** (1368-1437), was a Holy Roman Emperor. In 1414, he inaugurated the Council of Constance, which ended the Great Schism in the Roman Catholic Church. See also HUSS, JOHN.

**SIGMA XI**, *SIG mah ZI*, is an honorary scientific society. It was founded at Cornell University in 1886 to encourage study in all scientific fields. Members include men and women who have done important work in science. Qualified university students may be elected to associate membership.

Sigma XI has ninety-three chapters and forty local clubs located in leading universities throughout the United States. There are about 20,000 American members, and world membership is over 45,000. The society publishes a magazine called *American Scientist*. Another publication is *Science in Progress*, which contains articles by leading scientists of Sigma XI. The organization has headquarters at Yale University.

**SIGN, ELECTRIC**. See ELECTRIC SIGN.

**SIGNAL CORPS**. The Signal Corps is a branch of the United States Army which is responsible for the army's communications system. The insignia of the corps is a flaming torch and crossed flags. When this insignia was adopted in the 1860's, it correctly pictured the then most generally used signaling equipment. Today, however, the Signal Corps uses the latest and most scientific equipment in carrying on army communications.

Radar, one of the major scientific developments of World War II, was perfected and put into use under the supervision of Signal Corps engineers. "Walkie-talkie" sets which can be carried by a single soldier and which

permit immediate communication between headquarters and an army in the field were also developed by the Signal Corps during World War II. Signal Corps photography in the form of reconnaissance pictures and training films were valuable aids to the army during the war.

**Organization.** The Signal Corps of the United States Army is administered by a Chief Signal Officer, who has the rank of major general. Signal Corps units handle all signal communications at the headquarters of divisions, and at general headquarters of the army. The corps operates army post telephone systems, radio stations, research laboratories, photographic facilities, and a Signal Corps School. In the advance areas of the battle fronts, the infantry, cavalry, and field artillery install and operate their own signal communications system.

**History.** The Signal Corps dates from 1860, when Major Albert J. Myer was appointed as signal officer on the staff of the army. In 1863 the Signal Corps was established as a separate branch of the army. Major Myer was appointed the first Chief Signal Officer and elevated to the rank of colonel.

The Signal Corps has been called upon four times in its history to organize services for other branches of the government.

In 1870 the corps organized the first national weather service for the United States. By 1878 there were 224 Signal Corps weather observation stations throughout the nation. This service was transferred to the Department of Agriculture in 1891.

The Signal Corps organized the army's first air arm. In 1907 the Chief Signal Officer awarded a contract to the Wright brothers for the army's first heavier-than-air machine.

During World War I, the Signal Corps built up the army meteorological service. This service was turned over to the Army Air Forces in 1937.

The Signal Corps also organized the Army's photographic service, which provides still and motion pictures for training and historical purposes. E.C.O.

See also RADAR; SIGNALING; WALKIE-TALKIE.

**SIGNALING** is a way of passing information from one place to another. It may be done by sounds which can be heard or by signs which can be seen. The meaning of the signals must be learned in advance and must be known by both the sender and the receiver. Signals may be sent by voice or code over the radio, by hand flags or flags hoisted on masts and poles, by flashing or fixed lights, or by sound devices such as whistles, sirens, fog horns, or guns. Signaling also may be done by movements of the hands, or by using fireworks such as rockets, flares, smoke bombs, and parachute candles. Signals are used when a direct spoken or written communication is either impossible or undesirable. Signaling is especially important when there is need for secrecy. It plays an important part in navigation, aviation, railroading, in weather forecasts, and in many sports. In war, military and naval forces could not operate effectively without the use of signals.

#### Methods of Signaling

**Signaling by Radio.** Long ago, primitive tribes used huge, long funnels as loudspeakers to increase the range

of the human voice. Later, radios were developed that could send the human voice many thousands of miles. Signaling by voice over the radio is *radiotelephony*. It is used in aviation to give pilots information as to take-offs, landings, weather, and many other things. It is also used between ships, between aircraft, and in war between ground, sea, and air forces.

Messages can be flashed around the world by wireless radio at a fast speed. These signals are sent in the telegraphic code of dots, dashes, and spaces (see CODE). This system of signaling by radio is *radiotelegraphy*. Radio telephony is now widely used, and "scrambling is done to preserve secrecy.

**Semaphore** is signaling by two hand flags, each of which is usually half red and half yellow. Both the sender and receiver must be in full view of one another. The sender holds the flags at various positions to spell out words or a code. There are thirty-one different arm positions in semaphore. Each position represents one of the twenty-six letters of the alphabet, as well as the signals for "attention," "front," "numerals," "error," and "answering." Semaphore is widely used in the armed services and for fixed railroad signals where, however, movable arms are used.

**Flag Hoists.** Flags, banners, panels of cloth, and other things have been used to send messages since early times. Today, flags are hoisted on the yardarms of ships, on aviation control towers, and on military tanks. The United States uses the International Alphabet Flags, International Pennants, and International Repeaters (flags used to repeat the symbol shown above it). These flag signals were approved by the International Radiotelegraph Conference of 1927. They are used so that sailors of all nations, regardless of their native language, can read the flag messages. Flag signals are answered by repeating the signal or by hoisting the answering pennant.

Code books for flag signals are printed in seven languages. They include the combinations to be used for urgent messages, phrases commonly used, geographical tables, and other information useful in sending messages quickly. Many messages may be sent by using only one flag. Such flags say "ship is in quarantine," "pilot wanted," or other common expressions. Every registered ship may be identified by its signal-number flag. United States ships use the letters K, N, W. Aircraft carriers and air-station control towers also use various International Alphabet flags to give landing information to aircraft pilots.

**Flashing Lights.** In early times, soldiers flashed messages by reflecting the sun's rays on their polished shields. American Indians sent smoke signals from smoldering fires. Flashing light is the descendant of these methods of signaling. The International Morse code is used to flash light from searchlights, aircraft signal lights, blinker tubes, and yardarm blinkers. Some of these signals may be given by day, but they are most generally used at night. The flashes from large searchlights are controlled mechanically by opening or closing a metal Venetian-blind shutter. The aircraft signal lamps are light, portable searchlights equipped with a pistol grip for holding in the hand. Flashes are controlled by a trigger. A blinker tube looks like a gun. It is a light en-

cased in a tube which is operated by means of a trigger switch. Yardarm blinkers are special electric lamps located near the end of the yardarm on the masts of ships.

Other types of signaling by flashing light are done by using a common flashlight or a "biscuit gun." "Biscuit guns" are light tubes of red or green used by air control towers to signal directions to airplanes. Fixed lights or lanterns are used by railroads, ships, and aircraft. Ships and aircraft traveling at night or in bad weather must carry a steady red light to indicate the left side, and a steady green light to indicate the right side. International rules also require ships to carry fixed white lights as mastheads, range, and anchor lights.

**Signaling by Sound** is sending a message in Morse code by means of siren, whistle, foghorn, bell, or other device. Signaling by sound is an ancient practice. Indians and tribes of the African Congo warned of the approach of an enemy by beating out messages on drums or tom-toms. Sound signals are very important to ships and many such messages have been made a part of international law to prevent collisions at sea.

**Signaling by Fireworks.** Fireworks have often been used as signals of distress and recognition during an emergency. They are also used to light up or mark locations.

A parachute flare is a long-burning light attached to a large parachute. The flare may be fired from an artillery piece or released from an airplane. Another fireworks signal is the white smoke hand grenade which is used to attract attention. It burns about three minutes. Colored smokes were widely used in signaling during World War II. Other kinds of fireworks signals are Very's signal cartridges, day and night markers, and night drift signals.

**Panels and Hand Signaling.** Panels are strips of cloth laid out on the ground in a pattern to carry messages to aircraft. Paneling may be used by airmen who have been forced down, or by ground troops to direct an aircraft's attack in combat. Hand signals are commonly used in many sports, such as football, baseball, and hockey. Policemen, army tank drivers, motorists, and pilots also signal by hand. Some airplane pilots use the Morse code for signaling by hand; a closed fist means a dot and an open hand a dash.

**International Signals.** International Telecommunications Conventions are held to regulate communication between ships, aircraft, and land stations. Almost every country in the world is represented at these conventions. The signals agreed upon by this convention form a kind of international language. (A signal has the same meaning in all languages.) For example, the signal "CQ" calls to attention all stations within sight or hearing.

A ship or aircraft in distress sends out international signals for help. The signals may be used separately or in a combination of more than one. Some of the distress signals are:

#### **In the Daytime:**

A gun or other explosive signal, fired at intervals of about a minute. This signal is for ships. It also may be used at night.

The code signal "NC," meaning "I am in distress and require immediate assistance."

A continuous sound with any fog signal or other sound apparatus.

The distress signal "SOS," made by radiotelegraphy. The distance signal of a square flag with a ball either above it or below it.

#### **In the Daytime for Aircraft:**

A succession of white lights thrown into the sky at short intervals.

The radiotelephony call of "Mayday" (from the French pronunciation of the expression "m'aider," meaning "help me").

#### **At Night:**

Flames on the vessel such as from burning tar or oil. Rockets or shells, throwing stars of any color. The flares are fired one at a time at short intervals.

Any of the sound distress signals used also in day time. Other international signals are for pilot (mariner), quarantine, and towing. They may be flags, fireworks, or flashing light.

#### **Uses for Signals**

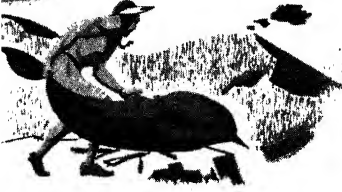
**Weather Signals.** A weather code is used to send out daily observations by radiotelegraphy. Weather information is exchanged daily among meteorological stations in the United States, Canada, Alaska, and the West Indies. This code is used with some changes in broadcasting data for aviation and commercial interests in the United States. Weather reports among weather stations are often telegraphed in code.

**Marine Signaling.** Nearly all ships carry radio equipment as well as equipment for the visual methods of signaling, such as flashing light, semaphore, flag hoist, and fireworks. Ships at sea receive information as to arrival, position of other ships, icebergs, and weather conditions. In waters off the United States, this information is signaled by radio broadcasts, and by the display of flags by day and lights by night from seaport towns. A red flag with a black center indicates that a severe storm is expected. At night an approaching storm is signaled by fixed red or white lights. Fog warnings are often sent by lighthouses and lightships by means of bells hung below the surface of the water. Water carries the sound of a bell about ten times as far and four times as fast as air does.

**Military Signaling.** Modern warfare has become very complicated, with widespread areas of fighting. There must be a system of communication between the various branches such as artillery, infantry, armored force, cavalry, and air corps. Most of this communication is handled by a special division of the army called the Signal Corps. Each unit also has a signal section for its own communication.

Methods of military communication include radiotelegraphy, radiotelephony, visual signals, homing pigeons, motor vehicles, airplanes, and foot runners. Signaling by radio is quick and efficient. But radios require highly trained maintenance and operation personnel. The biggest disadvantage of radio in warfare is the danger of message interception by the enemy. A radio transmitter may also disclose the location of the sender. But radio remains the principal means of communication for airplanes, tanks, and combat vehicles when speed is more important than security. The use of codes is usually also unsuccessful. Much time is

## EARLY METHODS



Smoke signals were used by the American Indians.

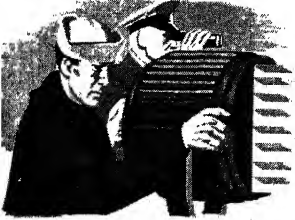


Drum signals were used by savages in Africa.

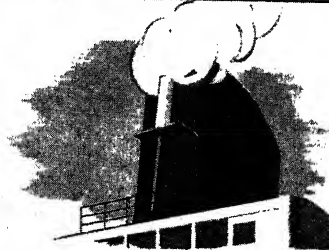


Beacon fires warned the English of the Spanish Armada's approach.

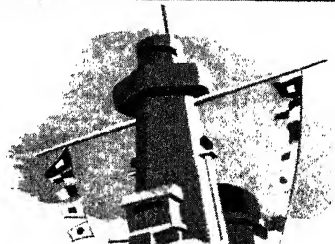
## SIGNALS AT SEA



Blinker lights can flash messages both night and day.

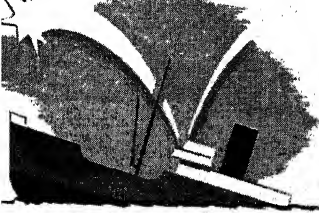


Whistles and horns prevent collisions during foggy weather.

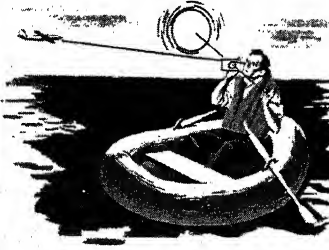


Flags and pennants have long been used to send messages.

## DISTRESS SIGNALS



Flares and rockets are shot from ships in distress.

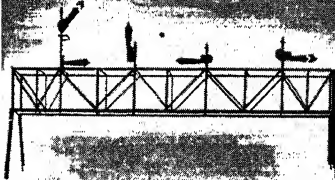


A simple device attracts rescuers by reflecting the sun on a mirror.



Colored blankets folded together signal distress.

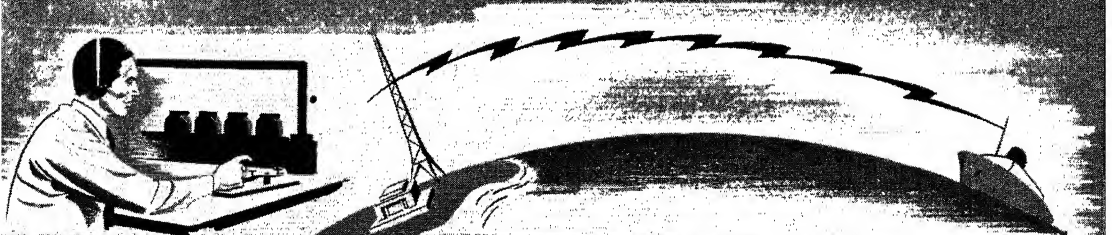
## RAILROAD SIGNALING



**Lightning Quick Signals** are needed in railroading. The traffic tower relays instructions to men who work levers which automatically control the signal lights.



## RADIO AND TELEGRAPH



Messages at sea were once limited to vision and hearing. Today, distant sea communication has been accomplished by the telephone and code.

lost in translating messages, and enemy experts can often solve them. During World War II, many portable radiotelephonic sets, called "walkie-talkies," and "handy-talkies," were used.

Wire communication is perhaps the most secure method of communication. But it requires much equipment and mechanical attention, and it often takes too long to put it into operation in a fast-moving situation. Wire is easily broken by shellfire and bombs, and by tanks and other combat vehicles. Permanent lines are often buried deep in the ground to avoid their being broken and service suspended.

In actual combat, visual signals are used over short areas, for field communication between the rear and the front, and in places where more permanent connections are not practical. Hand signals are often used by observers to direct the fire of machine guns and mortars.

The messenger or runner method of carrying information is also a type of signaling. It is one of the oldest means of keeping commanders in touch with existing conditions, giving warning, and carrying correspondence. Homing pigeons are often used in this phase of signaling. In World Wars I and II, dogs were often used as messengers and they displayed unusual intelligence and bravery. Motorcycles, jeeps, and airplanes are used by dispatch carriers. The chief danger in this type of signaling is that the messenger may be captured or killed and the correspondence may fall into the hands of the enemy.

**Aircraft Signaling.** Aviation played an important role in World War I, and an even more important part in World War II. It is growing constantly in value and strength in the fields of transportation and commerce. Communication with and between these airplanes is of great importance. The safety of aircraft passengers and personnel depends upon it. Signals must be passed between aircraft and ground stations concerning arrival, departure, position of planes, and weather information.

All airplanes are equipped with radio, and a great deal of information is sent by radiotelegraphy and radiotelephony. Aircraft blinkers, similar to yardarm blinkers, are mounted on the wings, and are operated from a switch on the electrical lighting panel. They are used for signaling landing fields and other aircraft. Flashing-light signals are widely used in night flying.

There is also a standard set of hand and head signals used between pilots. For example, when the pilot taps the earphones and holds his nose it is a signal that the radio is out of commission. The airplane itself is often used for signaling. When the leader of a formation shakes the wings and elevators, it is a signal to break up the formations.

Bombing may be considered the primary mission of military aircraft. But aerial units also render important service to the ground elements of the army and ships of the fleet. Airplanes direct long-range gunfire during combat. They "spot" the target and report errors in firing range and deflection to their base by radio. Air observers also have proved invaluable in scouting and reconnaissance work. Airplanes have been used to hunt submarines. If unable to destroy the sub, they mark the position by fireworks signal and direct naval forces to the attack.

One of the most important developments of the will be signaling by means of radar both in code and voice. The United States Army has already made contact with the moon.

**Related Subjects.** The reader is also referred to:  
Beacon  
Fireworks  
Heliograph  
Lighthouse  
Lightship  
Morse Code  
Radio (Uses of Radio)  
Semaphore  
Signal Corps  
Sign Language  
Siren  
SOS

**SIGNET RING.** See SEAL.

**SIGN LANGUAGE.** The language of signs was used long before the written history of mankind began. It was the earliest means of communication, used long before words and writing were invented. Some South American Indians still use the sign language in talking with members of other tribes who speak a different language. An Indian may break a strong stick to express the idea of *strength*. He draws a finger across his forehead, where the line of a hat would fall, to express the idea of *white man*.

Deaf persons talk by placing their fingers in a certain position to indicate each letter of the alphabet. (See DEAF-MUTE.) But this spelling with the hands is not properly a sign language.

A modern use of sign language may be seen at a football game. The referee holds both hands high above his head to show that the team has scored a touchdown. He places his hands on his hips to indicate an offside play. He grasps one wrist with the other hand to show that one of the players has been guilty of holding. There are ten such signals in the football sign language. E.L.S.W.

See also SIGNAL CORPS and SIGNALING for the systems of signs used in the government service.

**SIGNS OF THE ZODIAC.** See ZODIAC.

**SIGSBEE, CHARLES DWIGHT** (1845-1923), was an American naval officer. He was in command of the battleship *Maine* when it was blown up in Havana harbor in 1898. Sigsbee was



Charles D. Sigsbee was an American naval hero of the war with Spain.

graduated from the United States Naval Academy in 1863 and fought in the Battle of Mobile Bay during the War between the States. After the disaster to the *Maine* he was given command of the cruiser *Saint Paul*. In 1903 he was appointed rear admiral, and four years later he retired from the navy. C.L.L.

See also SPANISH-AMERICAN WAR (Causes of the War).

**SIGURD**, ZE goort, was the bravest warrior and hero of Northern mythology. He was the son of Sigmund and Hiortis, and was the champion of virtue and right.

Sigurd was taught by Regin at the court of AI. Regin excited him to perform deeds of courage. Sigurd was given his father's sword, and started out to kill the dragon Fafnir. He slew the monster and ate its heart.





**You're On — Start Talking!** signals the director from the glass-enclosed control room to the radio actors before the mike.

which made him understand what the birds said. They told him about a beautiful maiden named Brynhild who slept in a palace in the midst of a circle of fire. Sigurd found Brynhild and wakened her. He promised to return to rescue her. Then he went to the land of the Nibelungs.

The queen of the Nibelungs made a magic drink which caused Sigurd to forget Brynhild. He married the queen's daughter Gudrun, or Gutrune. Later he helped Gudrun's brother to get Brynhild for his wife. Brynhild could not forgive Sigurd's seeming forgetfulness and caused him to die. Then she killed herself on his funeral pyre.

The stories about Sigurd are in the *Volsunga Saga*, which is a Norse poem of the 1200's. Later the Germans told the same stories in the *Nibelungenlied*. P.COL.

See also NIBELUNGENLIED.

**SIKA**, *SE kah*. See DEER.

**SIKH**, *seek*. The Sikhs are followers of Sikhism, a religion of the Punjab region in northwestern India. The term *Sikh* means *disciple*. Sikhism was founded by Guru Nanak (1469-1538), who lived at the time of Martin Luther. Nanak tried to unite the Moslems and all castes, or classes, of Hindus into one great brotherhood. He taught that there is one true universal God. The central shrine of the Sikhs is located at Amritsar. Here the *Granth*, their scripture, is read aloud every day.

The political state of the Sikhs was established by Govind Singh (1666-1708). He built up their military power, to protect them from the Moslems and other religious groups. But after Singh's death, the Sikhs were overcome by the Moslems. A few Sikhs escaped to the mountains. They returned a few years later and captured Lahore. The Sikh communities were united from 1799 to 1824 by Ranjit Singh, a harsh ruler who gave himself the title of *maharajah*. By 1824 Ranjit Singh's military talent had brought under control most of northern India north of the Sutlej River. After his death, the Sikhs fought against the British in India. In the First Sikh War (1845-1846), they lost Lahore. In the Second Sikh War (1848), they were completely conquered by the British.

The Sikhs were afraid that Moslem power might be restored in India, and for this reason they supported the British during the Sepoy Rebellion (1857). The Sikhs loyally supported Britain in both World Wars I



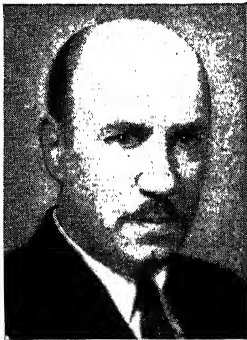
and II. There are about 4,000,000 Sikhs in India. They are chiefly farming people, but also are noted as splendid soldiers and policemen. G.N.MAY.

See also INDIA (Caste System; Cities, Amritsar; illustration, Sikh Policeman); PUNJAB; RANJIT SINGH; SEPOY REBELLION.

**SI-KIANG**, *SE-kyahng*, which is often called the West River, is the most important stream of southern China. The Si-kiang rises in the province of Yunnan and flows in a southeasterly direction for about 1,650 miles. It empties into the South China Sea. Canton, one of the largest cities in China, is located on the delta formed by the Si-kiang and smaller rivers. The river is of considerable commercial importance, because of its tributaries and a network of canals. Steamships can sail up the Si-kiang as far as Wuchow, 230 miles from the sea. Motorboats can proceed 470 miles above Wuchow. G.B.CR.

**SIKINNIS**, *sih KIN is*. See DANCING (Development of the Dance).

**SIKORSKY**, see *KAWR skee*, **IGOR I.** (1889- ), is an airplane designer. His first helicopter, which he designed at the age of twenty, did everything but fly. The helicopter he built thirty-two years later broke all existing records. Sikorsky also designed and built the first ocean-flying clipper plane and many other kinds of flying craft.



Harris & Ewing

**Igor Sikorsky** designed one of the first successful helicopters.

Sikorsky was born in Kiev, Russia. He entered the Naval College at Saint Petersburg in 1903, and later studied at the Polytechnique Institute in Kiev. The achievements of such aviation pioneers as the Wright brothers and Count Ferdinand von Zeppelin inspired Sikorsky. He borrowed money and took time from his studies to build unsuccessful planes. Finally in 1911 he built a plane which climbed to 1,000 feet and stayed in the air for half an hour. The next year, Sikorsky won the grand prize at the Moscow Aircraft Exhibition.

At the outbreak of the 1917 revolution in Russia, Sikorsky fled from the country. He arrived in America penniless in 1919. For four years he supported himself by teaching science, and then he borrowed enough money to start building planes. Within a few years he became a leader in the aviation industry, particularly as a manufacturer of amphibious aircraft. J.COR.

See also AUTOGIRO; HELICOPTER.

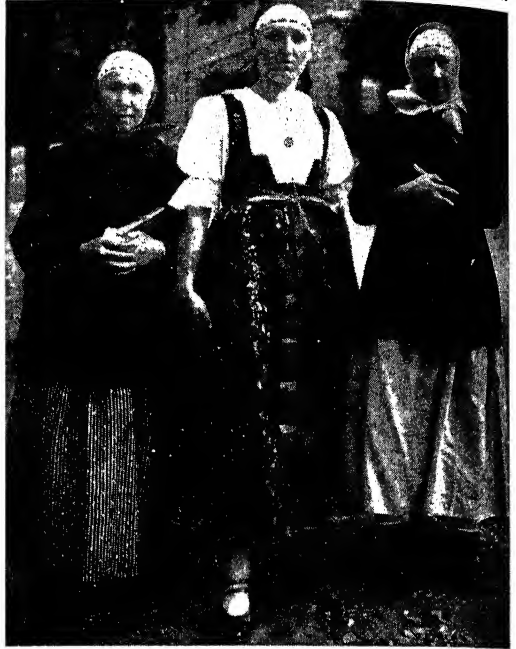
**SILAGE**, *SI lij*. See SILO.

**SILENCE**, **TOWER OF**. See TOWER OF SILENCE.

**SILENT**, or **DORMANT**, **PARTNER**. See PARTNERSHIP.

**SILENUS**, *sy LE nus*, was a half-god in Greek mythology. He was a wise old satyr, very fat and bald. Silenus nursed and taught Dionysus (Bacchus) with whom he was always to be found. He was good-natured and happy, and usually drunk on wine. Silenus could foretell the future, and charm all living things with his songs. See MIDAS; SATYR. P.CO.L.

**SILESIA**, *sih LE shih ah*, is a district consisting of the upper Oder River Valley. Before World War I most of



Ewing Galloway

**Women of Silesia Wearing Colorful Native Costumes**

Silesia was a province of Prussia, but the upper (southern) end was one of the Crown Lands of the Austrian Empire. It lies south of the province of Brandenburg, and its eastern boundary joins Poland.

Some Silesian territory passed into the hands of Poland and Czechoslovakia after World War I. Polish Silesia covers an area of 1,633 square miles, and has a population of 1,298,851. The district of Silesia in Czechoslovakia has an area of 1,550 square miles and a population of about 670,000. German Silesia under the republic was divided into two provinces totaling 14,024 square miles, with a population of 4,289,000.

The long chain of Sudetes Mountains winds across the province. Schneekoppe (5,260 feet) is the highest peak. Silesia has many mineral springs. More than half of the land will grow crops, and there are many small farms where wheat, rye, barley, potatoes, and beets are grown. The province contains rich coal and zinc deposits.

Soviet troops entered Silesia during World War II. In accordance with the Potsdam agreement nearly all of German Silesia was assigned to the Polish zone of occupation. B.W.W.

See also BRESLAU.

**SILHOUETTE**, *SIL oo ET*, is an outline drawing filled in with solid color to resemble a shadow. Any object may be drawn in silhouette, but the term usually refers to a profile or side view of the human head. Étienne de Silhouette (1709-1767), French minister of finance, is responsible for the name given this inexpensive kind of portrait.

The easiest way to make a silhouette is to place a small object, such as a leaf, a shell, or a key, on a piece

of paper. Draw a line around the edge of the object with a pencil, and fill in the outline with a dark color.

A silhouette portrait may be made by drawing an outline around a person's shadow. The person should sit between a lighted candle and a piece of paper on the wall. Another method is to photograph a person against the light of the window.

H.M.Ku.



**Silhouettes** lend themselves to fanciful decoration as well as to use in architectural design and other fields.

**SILICA**, *SIL ih kah* (chemical formula,  $\text{SiO}_2$ ), is the name given to silicon dioxide. It is the most abundant material in the earth's crust. It is also the most widely distributed. Silica is found in almost all parts of the world. It is supposed to make up about 60 per cent of the earth's crust. In the form of quartz, it makes up the largest part of sand. It is a necessary material in the formation of most crystalline rocks. Silica enters into chemical combinations with other substances to form part of many minerals, which are called *silicates*. It gives strength and toughness to some plant stalks, the quills of bird feathers, and some forms of living sponges. It also makes up the shells of some microscopic forms of life.

Silica is found in nature in both crystalline form and amorphous form, which means without a definite structure. It will not dissolve in water or in any mineral acid except hydrofluoric acid. Crystalline silica forms the common mineral, quartz, and the rare minerals tridymite and cristobalite. Some semiprecious stones, such as amethyst and jasper, are varieties of quartz.

Chalcedony and its varieties, onyx, flint, and jasper are a form of quartz called cryptocrystalline, which means they have extremely small grains. They are often colored by iron or other impurities. Opal is amorphous silica which contains a small amount of water. One variety of opal is known as geyserite. It is really a sort of hardened silica jelly. Some colored varieties of opal are classed as precious stones and are very valuable in the jewel trade.

A.PAB.

See also **OPAL**; **QUARTZ** (with list); **SAND**; **SILICA GEL**; **SILICOSIS**.

**SILICA GEL** is a colloidal form of silica that has a powerful affinity for water. This material, when dried, is used for removing water vapor and other gases from air. Silica does not react with many materials and therefore it is a safe substance to insert into a pipe as a filter. When the filter is saturated, it can be cleaned merely by heating the silica, after which the filter is as good as new.

When water is removed from silicic acid, a gel of silicon dioxide, or silica gel, is precipitated. The silica in this gel is very porous, and therefore valuable as a gas filter.

G.L.Bu.

**SILICATE**, *SIL ih kayt*. See **CERAMICS**; **SILICA**.

**SILICON** (chemical symbol, Si) is the most abundant nonmetallic element in nature except for oxygen. Silicon is never found in a pure state, but always combined with other elements. Crystalline silicon has been made from quartz in electric furnaces. Very fine-grained silicon, called *amorphous*, is a dark brown powder which will burn in air and chlorine and can be dissolved in alkalis. One of the principal compounds of silicon is the dioxide, or silica, which occurs chiefly as the common mineral quartz. See also **SILICA**.

A.PAB.

**SILICONE** is a kind of synthetic resin that is unusually resistant to fire and water. Silicones contain the element silicon, the foundation substance for some of the hardest rocks on earth. Silicon dioxide, or quartz, is a most resisting substance. Resinous derivatives of methyl-silicon chloride are tough, heat-resisting solids. Cloth soaked in silicone gum is fireproof, and is so waterproof that it can be made into a folding bucket.

G.L.Bu.

**SILICOSIS**, *siz ih KO sis*, is a disease of the lungs that is caused by breathing in dust that contains silica. Silica is a hard, colorless substance that comes in either crystal or powder form. It is made up of silicon and oxygen ( $\text{SiO}_2$ ) and is found in quartz, granite, flint, onyx, and in many rocks. It is also found in almost all types of sand and gravel. Persons who work in industries where there is a great deal of dust containing silica are in danger of contracting silicosis. Granite cutters, road builders, glassmakers, blasters, and workers in the abrasive and grinding industries are especially in danger of getting this disease. For this reason, silicosis is sometimes commonly called *grinder's disease*.

If a person regularly inhales silica dust for a year or more, the dust may begin to lodge in the lung and irritate the lung tissues. The lung may become inflamed and tiny swellings may begin to develop all over the lung. In the midst of each swelling, or *nodule*, there is a speck of silica dust. This silica dust has a bad chemical effect upon the body. Silicosis usually causes very short breath, coughing, and pains in the chest. As time goes on, the body becomes weaker and the person may not be able to work. He may finally get tuberculosis.

Silicosis causes the death of many workers every year. Preventing the disease involves supplying workers with masks, respirators, or nose filters. In the factory, ventilating systems help. During the 1930's, many workmen excavating a tunnel at Gauley Bridge in West Virginia were attacked by silicosis. As a result, the agitation against the disease caused increased protective measures.

P.R.C.

**SI LING-SHI**, see *ling-SHEE*. See **SILK**.

## SILK



**SILK.** According to an old Chinese legend, the story of silk began about 2700 B.C. in the garden of a Chinese emperor. Si Ling-Shi, the lovely young empress, sat drinking tea in the garden one day. As she gazed up into the mulberry tree above her, she saw a fat white worm moving its head back and forth. From the worm's mouth sprayed a fine, shiny strand of a lovely golden color. Si Ling-Shi watched in wonder as the strand became longer and longer and the worm wrapped it round and round itself to make a cocoon. The cocoon was so beautiful that the young empress began to wonder how she would look dressed in a gown made from the threads of many such cocoons. She plucked the cocoon from the mulberry tree and dropped it into her tea. When it had softened, she took hold of one end of the thread and carefully unwound it.

When Si Ling-Shi returned to the palace, she persuaded her husband to give her a whole grove of mulberry trees, where she could grow many thousands of the worms that spun such beautiful cocoons. In the years that followed, the empress spent many hours working with the worms and cocoons. Finally, she had unwound enough of the cocoons to weave a material of wonderful beauty from their delicate threads. The Chinese named the lustrous cloth *si* for their empress. *Si* has been the Chinese word for silk down to the present day.

No one knows whether this story is true. But for more than 2,000 years after the time of Si Ling-Shi the Chinese were the only people in the world who knew how to make silk. They guarded the secret of the silkworm carefully. Anyone who was caught trying to steal silkworms, or the silk-moth eggs from which they hatched, was put to death. During this time, Chinese merchants grew rich trading in silk with the other countries of Asia and Europe. Silk became so expensive that it was known throughout the world as the "cloth of kings."

**Silk-Making Spreads to the West.** Justinian, who ruled the Roman Empire from Constantinople (now Istanbul), met two Persian monks who had been to China in about A.D. 550. These monks told him a wonderful story of eggs and worms and silk. Justinian decided to get the secret of silk for his own country. He sent the monks to China with instructions to bring him some of the prized eggs. Several years passed before the

## SILK

monks came back, but they finally brought some of the precious silkworm eggs. The monks had smuggled the eggs from under the very noses of the Chinese by hiding them in the bamboo staffs which the monks carried.

During the next few hundred years, various peoples of the Western World learned how to grow silkworms and take silk from their cocoons. The Moors introduced silk cultivation into Spain in the 800's, and the art spread to Italy in the 1100's. Florence, Genoa, Venice, and Milan soon became famous silk-making centers. In the 1200's, the French became rivals of the Italians as silk makers. The industry was carried to England by Flemish weavers in the 1500's.

Today, the making of raw silk, called *sericulture*, is carried on in many countries of the world. In normal times, the Japanese lead the world in the production of raw silk. The Chinese rank second in silk making. Italy, France, and India are also large silk producers.

**Properties of Silk.** Silk is one of the strongest of fibers. A thread of silk is two thirds as strong as an iron wire of equal size. Silk is very elastic and so smooth that dirt does not cling to it easily. These qualities make silk one of the most useful materials of the textile world. It is made into hundreds of different articles, ranging from spider-web sheer silk hose to heavy brocade furniture upholstery. The United States is the world's largest manufacturer of silk products.

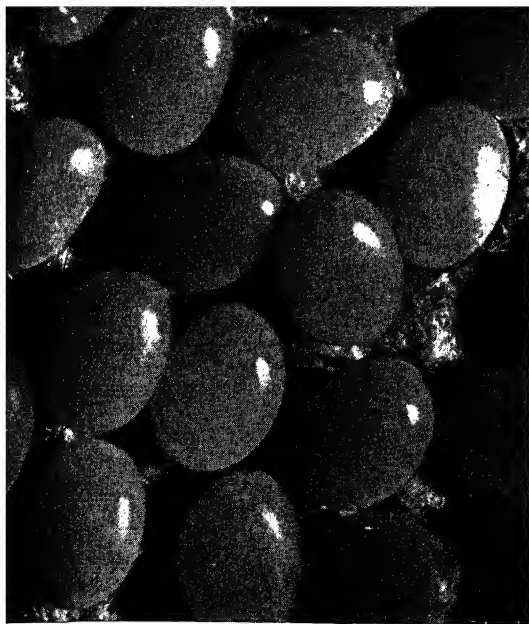
### The Silkworm

The so-called worm that makes beautiful and lustrous silk is the caterpillar, or larva, of a kind of moth. It is called *Bombyx mori*. The first part of its name comes from the family of moths, *Bombicidae*, to which it belongs, and the last part comes from the scientific name of the mulberry tree on which it feeds, *Morus multicaulis*. The *Bombyx mori* is a rather large white moth, with black-lined wings. Its body is short and blunt, with stout legs. From wing tip to wing tip, the moth measures about two inches.

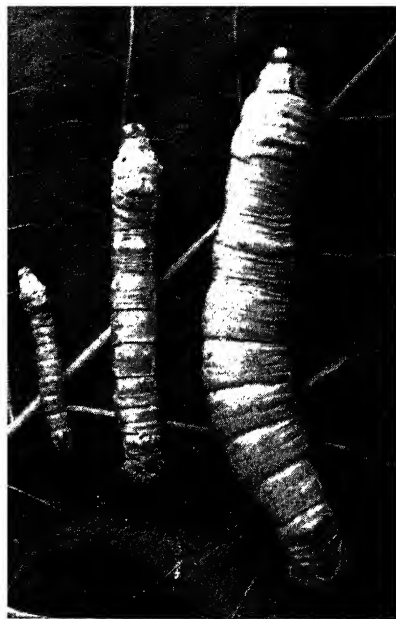
Wild silk moths lay their eggs in mulberry trees, and the newly hatched worms, or *larvae*, are left to shift for themselves. But the *Bombyx mori* is pampered like a newborn baby. It is raised in the silk farmer's own home, under carefully controlled temperatures. It is protected from mosquitoes, flies, and other insects. The silk farmer must always be careful to wash his hands before handling the *Bombyx mori*. During the time when the worm is spinning its cocoon, the whole family must avoid loud noises and speak in hushed whispers, or these delicate creatures will stop their work.

Early in the summer the female moth lays from 200 to 500 eggs on special strips of paper that the silk farmer provides. The farmer takes the eggs and puts them in cold storage to be kept until the following spring, when he wants the eggs to hatch. Three or four days later, the female moth dies.

In the spring, as soon as the first green leaves appear on the white mulberry trees which are preferred for silk culture, the farmer takes the moth eggs from storage. In some of the villages of China and Japan, there is a community incubator where small silk farmers take the eggs to be hatched. But many of the large silk farmers have their own incubators.



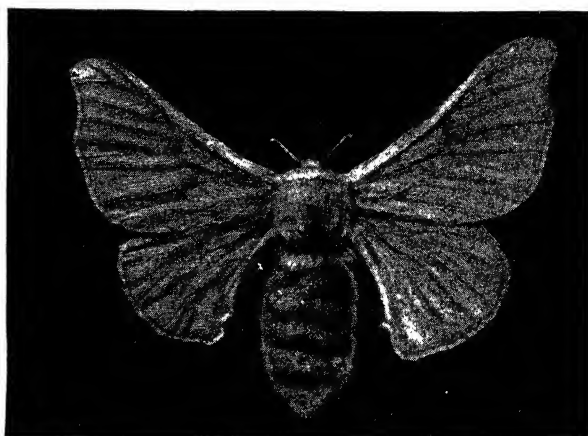
Newly Laid Silkworm Eggs, Spread on Cloth for Cold Storage



Stages of the Pupa's Development



Cocoon Opened to Show Pupa



The Adult Female Silk Moth Measures about Two Inches Across

U.S.D.A.; L. W. Brownell

The eggs hatch out into tiny white worms, from an eighth to a quarter of an inch long, and no thicker than a hair. Now the silk farmer's real work begins. The newborn worms are greedy eaters, and the farmer's whole family is kept busy bringing in mulberry leaves for the worms to feed on. The whole house is filled with the sound of crunching leaves. The worms eat steadily for the next five weeks. During this time, the worms eat their own weight in leaves every day. They grow so fast that they shed their skins four times. At the end of five weeks, the *Bombyx mori* is about three inches long and nearly half an inch thick. Its body is divided into twelve sections. It is supported by three pairs of true legs and has five pairs of hooked leglike bits of flesh, called *prolegs*, on the hind sections.

Now the silkworm is full grown and is ready to spin its cocoon. One day it stops eating and raises its head, swaying backward and forward in search of a twig on which to fasten its cocoon. The silk farmer rushes to

bring in a rack of tiny cells to the silkworms. He places each worm in a cell. Each worm begins to spin. Two glands in the silkworm's body begin to give off a glue-like fluid which comes out of an opening in the worm's upper lip. As the spray of fluid hits the air, it hardens into fine silk thread. First the worm spins the outer covering, or floss, of its cocoon. Then it begins to wind the long, continuous thread of silk around and around its body. As the worm spins on, it shrinks smaller and smaller, and is finally hidden from view.

If the cocoon is left undisturbed, the worm will turn into a tiny moth, or pupa, and bore its way out of its silky covering in two or three weeks. But silk farmers do not let this happen, except in the case of a few moths which they need for the next year's batch of eggs, because it would spoil the cocoon. In cocoons that are to be used for silk, the insect is killed before it attacks its covering. This is done by placing the cocoon in a hot oven or giving it a steam bath.



### From Cocoon to Counter

**Unwinding the Cocoon.** After the tiny pupae have been killed, the silk farmer is ready to begin unwinding the long delicate threads of the cocoons. This is a very delicate job. In countries where this is done by hand, women do most of this work. The cocoons are first sorted for color—either golden, light yellow, or white. Then they are soaked in warm water to soften the gum that holds the thread together. While the cocoons float on the water, a worker stirs them to catch any short loose threads. When these are removed, a young girl or woman finds the ends of the threads of about four or five cocoons. She twists them together, and puts them into a guide, much like the eye of a needle. Several strands are used because the single thread would be too delicate for winding and would break. Now, the silk is wound round and round on the reel. Sometimes a single silk thread as long as 1,000 feet is wound onto the reel. Each thread is so fine that it would take about 1,000 miles of it to make a pound of raw silk.

After the silk is reeled off the cocoon, it is unwound from the reels and twisted tightly into skeins, or hanks, of raw silk. Then, the silk is ready to be shipped to the manufacturers of silk cloth.

**Throwing.** The raw silk is much stronger than it was when it left the cocoon, but it is still not strong enough to be woven into anything except the sheerest material. *Throwing* is the name for a series of processes which raw silk undergoes from the time it leaves the skein until it is woven.

When the raw silk comes into the factory, it is first washed and dried. Next, any knots in the threads are smoothed out by passing the silk between fixed plates. Then it is rewound onto large spools. Now, the spools are put on a large machine called the *throwing frame*. Here the threads from two or more spools are combined to form one strong thread. This thread is called *tram* silk, and is used to make the crosswise, or *woof*, threads in weaving. Sometimes the threads are twisted in the same direction before they are combined. Then, they are combined and twisted in the opposite direction. This makes a silk yarn, called *organzine*, which is used for the lengthwise, or *warp*, yarns in weaving heavier fabrics.

**Weighting.** When silk comes from the throwing machinery, it still has too much natural gum on the strands. It is boiled, or scoured in a solution of hot soap to remove this gum. Scouring also prepares the silk for taking the most brilliantly colored dyes. But it causes the silk to lose from 25 to 30 per cent of its weight. This loss is

sometimes made up by a process called *loading*, or *weighting*.

Weighting involves using such chemicals as the salts of tin, lead, or iron. Silk may be weighted up to an amount far over the loss from scouring. Weighting beyond certain limits (15 per cent for black, 10 per cent for white and colored fabrics) is considered an adulteration. Too much weighting will cause silk to crack and tear. The best grades of silk are not weighted and are sold as *pure-dye* silk. One way to tell whether silk is weighted is to shake the material and see if it rustles. Weighted silk has a rustle which is easily heard, while unweighted silk makes no sound when it is moved.

**Weaving.** The brilliantly dyed silk yarns are woven on looms very much like those used for cotton and wool

(see WEAVING). Power looms have taken the place of hand-weaving methods in almost all the countries of the world. In China, where there is a great deal of low-cost labor, weaving is still a hand craft. Hand-woven Chinese silk is one of the most expensive materials, and is used mostly in neckties and scarfs.

**Spun Silk.** Only about 700 out of every 1,000 feet of silk thread can be unwound from the cocoon. The thread that is left, as well as the flossy covering of the cocoon, is first combed to remove impurities, and then the straightened fibers are run together until a long thread is made. This thread is called *spun silk*. It is not so strong or

lustrous as reeled silk. It is used in making rough-textured fabrics. Hat braids and dress trimmings are also made from spun silk.

**Silk Products.** Different ways of weaving and finishing silk give a wide variety of silk materials, such as satin, velvet, crepe, and brocade. Another important branch of silk manufacture includes the making of hosiery, underwear, ribbons, upholstery fabrics, curtains, fringes, and hat trimmings. Paterson, N.J., is the center of silk manufacturing in the United States.

Silk pongee and silk shantung are woven from the cocoons of wild silkworms. These fibers are called wild silk.

L.A.H.

**Related Subjects.** The reader is referred to the list of books following the article TEXTILE and also to the following articles:

#### SILK MATERIALS

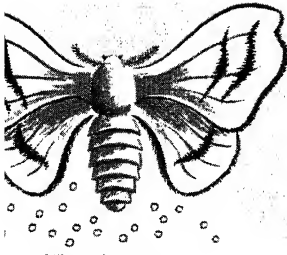
Brocade	Grosgrain	Serge
Chiffon	Lace	Shantung
Crepe	Moiré	Taffeta
Duvelty	Mousseline de soie	Tulle
Faille	Poplin	Velvet
Foulard	Ribbon	Voile
Gauze	Satin	



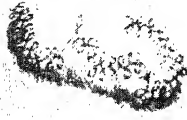
Erwine Galloway

**Chinese Girls Sort Cocoons** in a silk factory at Hangchow, China. The cocoons resemble pile of small eggs.

# HOW SILK IS MADE



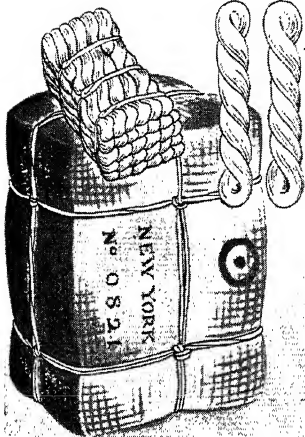
Silk moth lays  
200 to 500 eggs.



Silkworm spins cocoon  
containing between 500  
and 1,300 yards of fiber.



Cocoons are sorted.



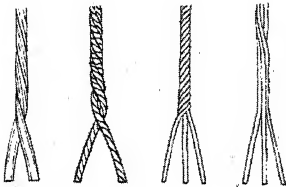
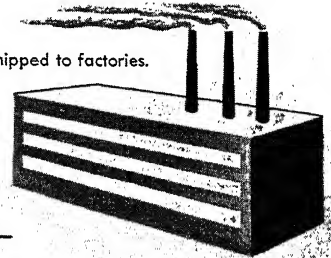
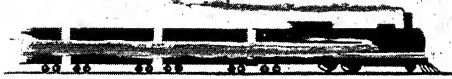
Silk from reels is twisted into  
skeins, tied in bundles, and baled.



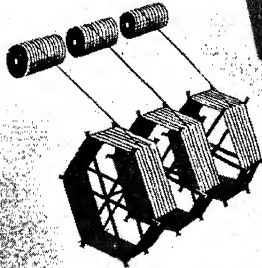
Cocoons are soaked and  
silk fiber is wound on reels.



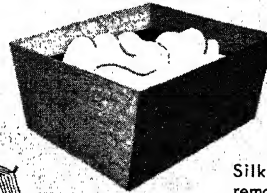
Raw silk is shipped to factories.



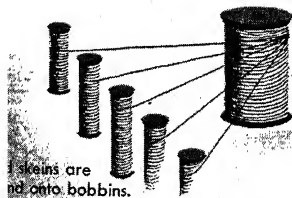
Different kinds of thread are  
made during twisting process.



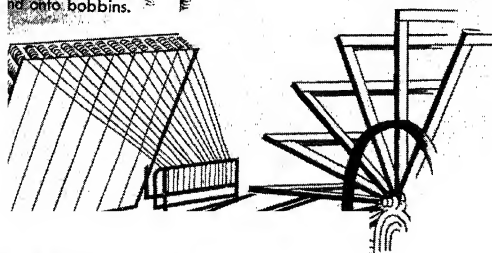
Thread from 2 to 20 bobbins  
is wound onto spools.



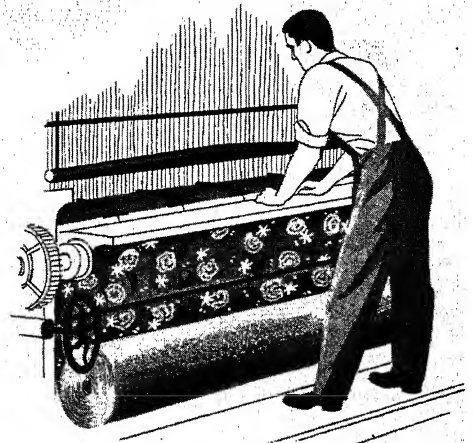
Silk is washed to  
remove natural gum.



Skeins are  
wound onto bobbins.



Thread from scores of spools is  
drawn off in parallel strands  
to make yarn on the warp frame.



Warp webs, or yarn, go to loom  
where they are woven into cloth.

Cocoon	UNCLASSIFIED Moth (Giant Silk- worm Moths)	Mulberry Paterson
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## Outline

- I. Introduction
- II. Silk Making Spreads to the West
- III. Properties of Silk
- IV. The Silkworm
- V. From Cocoon to Counter
  - A. Unwinding the Cocoon
  - B. Throwing
  - C. Weighting
  - D. Weaving
  - E. Spun Silk
  - F. Silk Products

## Questions

- Why does silk rustle?  
 What story do the Chinese tell about the discovery and first use of silk?  
 How did the Chinese guard the secret of silk making for a long time? Why?  
 How did peoples of the Western World first learn how silk thread is produced?  
 What Italian cities early became silk-making centers?  
 How does a silk thread compare in strength with a steel wire of equal size?  
 How do the farmers get the silkworm eggs to hatch just when they want them to?  
 How large is the average silkworm?  
 Why do silk farmers kill the insects inside the cocoon before they can come out? How do they do this?  
 How many feet of fiber may come from a single cocoon?

**SILKWORM.** See **SILK**.

**SILKWORM GUT** is a strong thread made from the fiber drawn from a silkworm which was killed at the time it was ready to spin. It is invisible under water, and is used for the hook ends of fishing lines.

**SILL.** See **CARPENTRY** (Sills).

**SILLANPÄÄ, SIL lah PA, FRANS EEMIL** (1888- ), is a popular Finnish writer of novels, articles, and short stories. He won the Nobel prize for literature in 1939. Sillanpää was born in Hämeenkyrö. His first novel, *Life and the Sun*, was published in 1916. Three years later his *Meek Heritage* won praise throughout Europe. After its publication, the Finnish Government gave him a pension to permit him to spend his entire time writing. *The Maid Silja* was translated into English and published in the United States. L.J.

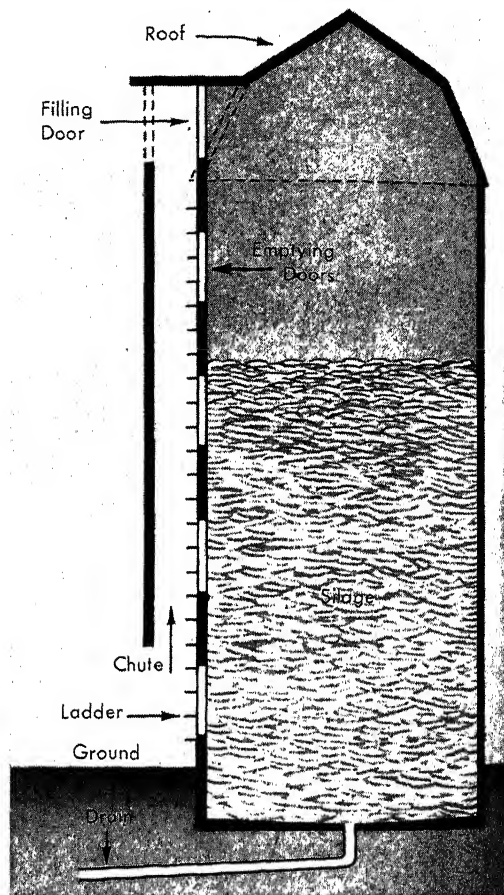
**SILO, SI loh.** A hundred years ago, cows in the colder climates gave much less milk during the winter months than in summer because they were deprived of the green, juicy grasses and grains needed to produce a large amount of milk. Today, feed stored in the silo makes it possible for cows to produce as much milk in winter as they do in summer.

The silo is a round, tank-shaped storage bin for green grains and grasses, such as corn, clover, oats, rye, and alfalfa. The feed is preserved in the silo by exclusion of air and by acids, mostly acetic, produced by fermentation. When the feed is taken out of the silo, it is no longer green in color, but it has nearly as much food value as fresh feed has. If the feed does not contain enough sugar or starch to ferment, sulfuric acid or phosphoric acid may be added to assist in preserving the feed.

**Development of the Silo.** Americans learned how to make silos from the Europeans in the early 1870's. The

first silos were pits that were dug into the ground. When the pits were filled, they were covered with boards to keep out air and help preserve the feed, or silage. In 1873, Fred L. Hatch, a farmer in McHenry County, Illinois, tried building a silo above the ground. Hatch's silo was a square wooden building. It was more successful than the pits, but the square corners made it impossible to pack feed tightly in all parts of the silo, and much of the feed spoiled from exposure to the air. The round silo is the best form to resist the heavy bursting pressure of the feed packed in it.

Today, round silos that are built high above the



**Cross Section of a Silo.** Silo is filled through door at the top. Silage is removed from the top down, through a series of doors opening into the chute.

ground are used all over the world. The materials used to build modern silos include stone, brick, clay tile, sheet metal, concrete, cement block, and wood staves. Cypress and redwood are the chief woods used for silos which are built from staves. The staves are placed upright, and held tightly together by iron hoops. Whatever the material used, the walls must be air tight and moisture proof in order to bring about natural fermentation and prevent decay. The walls must also be built strong enough to resist pressure from the inside. A smooth in-

side surface is necessary in the silo so that the feed will settle evenly in the tank. Doors are built at different heights in the silo walls for removing the silage as it is needed for feed.

**Silage, or Ensilage.** Nearly all food plants can be stored in the silo, but corn is most often used. The crop is cut before the plants are dry. It is usually chopped into pieces from  $\frac{3}{4}$  to  $1\frac{1}{2}$  inches long by a machine called a *silage cutter*. Then it is elevated into the silo with a pneumatic or chain conveyor elevator and packed evenly. A cubic foot of properly packed silage weighs about forty pounds. Silage is not the cow's only winter food, and forty pounds of it is enough for a daily ration. The top layer of silage spoils when it is exposed to air, and thus protects the silage underneath before the silo is opened for feeding. Care should be taken to remove silage in even layers. About two inches of the feed must be removed daily to keep the surface fresh. J.B.D.

See also CORN; FERMENTATION.

**SILT** is a fine-grained or muddy material which is made up of tiny particles of rock which settle at the bottom of rivers and other bodies of water. A material which sinks in water or air is known as *sediment*. Common examples of sediment are silt, sand, gravel, mud, and dust, or soil. Silt is made up of tiny particles which are anywhere from .01 to .1 mm. (.0004 to .004 inches) in diameter. The larger grains are called *coarse silt* and the smaller grains are called *fine silt*.

Lands on which silt has been deposited by the action of rivers are usually very fertile. E.D.W.

**SILURIAN**, *sih LU ri ah an*, **PERIOD**. See GEOLOGY (Outline of Earth History).

**SILVER** (chemical symbol, Ag). Some of the most useful and beautiful objects of the world are made from this lustrous, moonbeam-colored metallic element. This precious metal was known and used by primitive men. The ancient Hebrews knew it by a name meaning *pale*. The name the ancient Greeks gave to silver meant *shining*. The chemical symbol for silver, Ag, comes from its Latin name, *argent*.

The gleaming sterling tableware treasured in many homes is made from silver. Ornaments and jewel settings of great value also are made from the precious metal. Silver is widely used in surgery and dentistry because it does not tarnish easily. In photography, compounds of silver are used for purposes ranging from coating the film to developing it. The photographic industry is the world's largest user of silver.

**Properties of Silver.** Silver is harder than gold, but softer than copper. It can be hammered out into sheets so thin that it would take 100,000 of them to make a stack an inch high. These sheets are so thin that light shines through them. Silver also may be drawn out into wires finer than human hair. It is the best conductor of heat and electricity among the metals. But its high cost usually makes it impractical to use silver as a substitute for copper in electrical conductors.

Silver melts at a temperature of about  $1,762^{\circ}$  Fahrenheit, or  $961^{\circ}$  Centigrade. When silver is melted, it has the power of absorbing as much as twenty times its own volume of oxygen.

One of the most interesting experiments of the chemical laboratory is to expose molten silver to the air. As the

silver absorbs oxygen, it swells larger and larger. Then the metal begins to cool and become solid again. As it does so, it gives up the oxygen and slowly shrinks back to normal. When the silver cools too fast, a crust forms on top of the mass before all the oxygen gets out, and bubbles of oxygen form in the metal. The bubbles grow larger and finally explode through the crust, driving out balls of silver with soft, swooshing noises. This action is known as *spitting*. It takes place only in pure silver. In working silver for commercial purposes, spitting is prevented by adding a small amount of some other metal to molten silver.

Silver is not changed by moisture, dryness, alkalies, or vegetable acids. But sulfur, or air that contains sulfur, will cause silver to turn black. For this reason silver tarnishes very quickly in places where coal gas, which contains sulfur, is likely to creep in.

#### Sources of Silver

Pure silver is mined chiefly in Mexico, Idaho, Utah, Arizona, Montana, Ontario, British Columbia, Peru, British India, and New South Wales. The most important silver ores are the sulfides—that is, those containing sulfur. The richest ore mineral of silver is called *argentite*. It is classified as a simple sulfide because it contains pure silver and sulfur. Argentite is made up of two parts silver to one part sulfur.

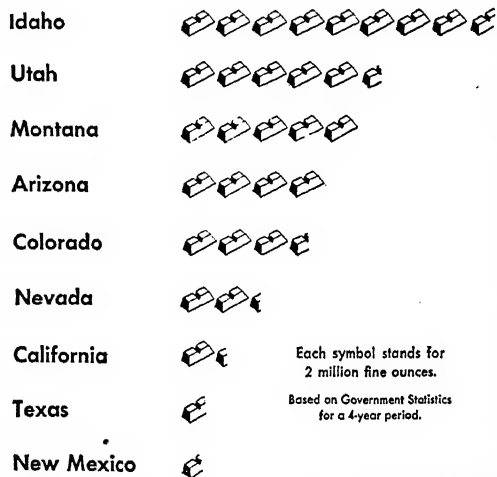
The other sulfides are more complex and are found chiefly in Mexico, Peru, Bolivia, Chile, and Idaho. *Light ruby silver* contains arsenic, sulfur, and silver. *Dark ruby silver* contains antimony, sulfur, and silver. *Brittle silver* is made up of the same combining elements as dark ruby silver. Other important silver ores include *horn silver*, which contains chlorine and silver, and *hessite*, a compound of silver and tellurium. Galena, the chief ore of lead, often carries silver. In most of the silver-producing countries of Europe, silver is found in lead ores. There is a valuable lead mine in the Coeur d'Alene dis-

#### Ten Leading Silver Countries

Mexico	
United States	
Canada	
Peru	
Japan	
U. S. S. R.	
Germany	
Burma	
Belgian Congo	
Yugoslavia	

Each symbol stands for  
10 million fine ounces.  
Based on Government Statistics  
for a 4-year period.

### Nine Leading Silver States



tract of Idaho, where silver is mined in large quantities. Silver occurs with copper in the Butte (Mont.) district. There is a famous silver-copper mine in Mansfield, Germany.

Sometimes silver is found alloyed with other metals, such as gold, mercury, and copper.

### Silver Production

The richest silver mines of the world are in North America. Mexico, the United States, and Canada produce about three fourths of the world's supply of silver. Mexico and the United States are rivals for first place among the world's silver-producing countries. Other great silver-producing countries of the world are Peru, Bolivia, Chile, Germany, Spain, New South Wales in Australia, India, and Japan.

The leading silver-producing states of the United States are Idaho, Utah, Montana, Arizona, Colorado, and Nevada. In Canada, Ontario and British Columbia furnish most of the silver. In the cobalt area of Ontario, high-grade silver ores carry from 3,000 to 4,000 ounces of silver to the ton. These ores are now largely exhausted.

Silver mines may be close to the surface or they may go down for thousands of feet in the earth. The metal is mined in the same way as other underground deposits of metal.

After mining, silver ores are usually concentrated to a rich concentrate which in turn is *smelted* (a heat process). The product of the smelting is further refined in various ways which remove the metals associated with the silver. The cyanide process, however, makes silver-gold bullion direct from the ore.

### Uses of Silver

Pure silver is too soft to stand up under constant wear. So it is usually mixed with copper to form an *alloy* before it is made into commercial articles. The copper-silver alloy is used by silversmiths to make coins, jewelry, and tableware. Silver coins in the United States are made of

900 parts silver to 100 parts copper. In Great Britain, coins contain 925 parts silver to 75 parts copper.

*Sterling* silver contains at least as much silver as British coins, and often more. The word *sterling* has been used to mean high quality silver since the 1200's. At that time, the coins of England had decreased in value and contained little silver. The only coins that contained large proportions of silver were those coined by the merchants of the Hanseatic league in northern Germany. These coins were called *Easterlings* to distinguish them from the low-silver alloy coins of England. English speech quickly turned *Easterling* to *sterling*.

*Silver plate* is made by coating cheaper metals with pure silver or silver alloy by electrolysis (see *ELECTROLYSIS*). Silver plate does not wear so well as solid silver alloy; because the cheaper metal shows through as the plate wears off. But silver plate is a good deal cheaper than solid silver, and is more widely used by silversmiths for tableware than sterling is.

In the laboratory, silver has many uses. One of its most important chemical compounds is called *silver nitrate* or *lunar caustic*. This compound is made by dissolving silver in nitric acid. Silver nitrate is widely used in photography, silver plating, and indelible ink. *Silver chloride* is made by adding hydrochloric acid to a solution of silver. The silver chloride is then combined with silver bromide for use in various chemical processes of photography.

Silver fulminate—which contains nitrogen, carbon, hydrogen, and oxygen in addition to silver—is a violent explosive. But its use in explosives has been largely displaced by mercury fulminate and other cheaper compounds.

H.A.Sc.

**Related Subjects.** The reader is also referred to:

Alloy	Ductility
Bullion	Money
Colonial Life in America (Metalware)	Silver Nitrate

### Questions

Where does the chemical symbol Ag for silver come from?

Why does silver tarnish rapidly where there is coal gas?

Where is pure silver mined? What is the leading sulfide of silver?

With what other metals is silver sometimes found?

About how much of the world's silver is produced in North America?

How much silver is usually present in a ton of ore from the cobalt area of Canada?

How and why is silver *smelted*?

Why is silver usually alloyed with other metals for commercial articles?

What is *sterling* silver? From where does the name *sterling* come?

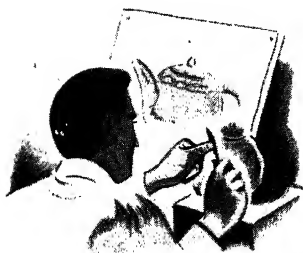
**SILVER, ABBA HILLEL** (1893- ), is an American rabbi and Zionist leader. He was born in Neinstadt, Lithuania, and settled in the United States in 1902. He was graduated from the University of Cincinnati and the Hebrew Union College. In 1917 he became rabbi of The Temple in Cleveland, Ohio, one of the largest Jewish Reform congregations in the United States. He helped to promote the first unemployment insurance law in Ohio, as well as child labor laws.

I.J.R.

**His Works** include *Religion in a Changing World* and *The World Crisis and Jewish Survival*.



## THE SILVERSMITH AT WORK



A wax model is made from the artist's design.



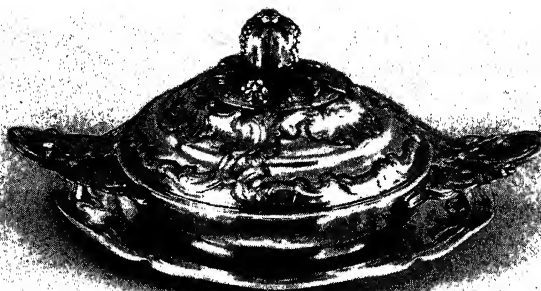
Circular designs are shaped on a wheel or lathe.



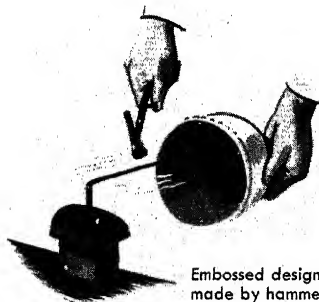
**This Beautiful Chocolate Pot** is a masterpiece of the silversmith's art. It was made in London in 1697 by the English craftsman, Isaac Dighton.



Some parts are shaped by hand hammering.



**A Covered Dish and Plate.** This intricate design was done by the French silversmith, L. Landes, in Toulouse, about 1773.



Embossed designs are made by hammering.



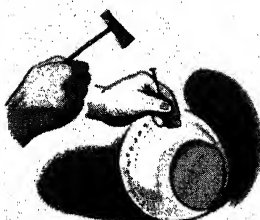
Covers for vessels are stamped out on a hand press.



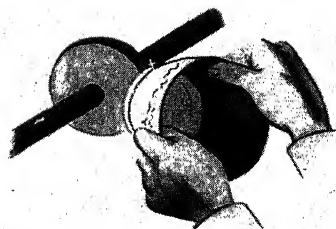
Solid parts and figures of the piece are cast.



**A Coffee pot** made in New England by the American silversmith, Samuel Edwards, during the early 1700's.



Chased designs are added by skilled engravers.



The finished piece is cleaned and polished on buffing wheels.

Photos: Metropolitan Museum of Art

**SILVER AGE.** See AGE (Golden Age).

**SILVER BIRCH.** See BIRCH.

**SILVER BROMIDE.** See BROMIDE.

**SILVER CERTIFICATE.** See MONEY (Kinds of Paper Money).

**SILVER CHLORIDE.** See CHLORIDE; SILVER (Uses of Silver).

**SILVER FISH** is a small insect house pest which has no wings and is of a silvery color. It is one of the most primitive of insects, and has two long feelers or antennae, and three long appendages at the "tail" end. A related insect is called the *firebrat*, because it loves warmth. Both insects eat wallpaper, or any paper with paste or glue on it, such as the bindings of books, or starched clothing. They can be controlled by dusting with pyrethrum powder. A.Sr.

**SILVER FOX** is a silvery appearing fox. It is a red fox whose fur is dark instead of the usual red. It may have normal red brothers and sisters. The silver fox looks like a small collie dog. It is slender and usually weighs no more than ten pounds. Its fur is long and soft and is



Fish and Wildlife Service

The Beautiful Little Silver Fox is one of the most highly valued fur-bearing animals of North America.

black with more or less white-tipped hair. This gives the fur a silvery appearance. The silver fox has a long sharp nose and small piercing eyes. It has a keen sense of smell, sight, and hearing. It is a very clever animal and can tell immediately if there is an enemy approaching.

The silver fox lives in forests, in mountains, and in flat countries where there is a great deal of plant life. It may be found throughout most of the United States, Canada, and Alaska, but is most numerous in Alaska and western Canada. It may make its own den in a rocky ledge, in the earth, or in a hollow log. It also may take over the home of another animal, such as the badger, coyote, marmot, or woodchuck because its legs are not very good for digging homes. The silver fox eats birds, rabbits, mice, ground squirrels, and other small animals, as well as birds' eggs, fruits, insects, and anything dead that it happens to find.

The silver fox is a valuable animal because of its fur. There are many "farms" throughout the United States and Canada that raise nothing but silver foxes. The furs are made into coats, scarfs, and trimmings for coats and are quite expensive. V.H.C.

See also FOX; FUR INDUSTRY.

**Classification.** The silver fox belongs to the species *Vulpes fulva*.

**SILVER FULMINATE.** See SILVER (Uses of Silver).

**SILVER NITRATE** (chemical formula,  $\text{AgNO}_3$ ) is a salt that is very important in medicine and industry. The pure salt has the form of colorless crystals, which dissolve very readily in water. They are prepared by dissolving silver in nitric acid, and then evaporating the liquid.

Sticks of silver nitrate are used in surgery to burn out infected flesh from wounds. This is called *cauterizing* the wounds, and the sticks of silver nitrate are called *lunar caustic*. They are made by melting the salt crystals and pouring the liquid into molds. Lunar caustic also is used to remove warts. A dilute solution of silver nitrate with potassium nitrate is a mild antiseptic. Doses of silver nitrate are given internally for epilepsy and for diseases of the stomach and intestines.

Silver nitrate is also used in its wild form in treating eye diseases.

Silver nitrate also is important in the chemical laboratory for preparing other compounds of silver. Its reactions with many chemicals are easy to observe so it is used as a reagent to test for their presence.

Organic materials change silver nitrate back to silver, and leave a black stain. This reaction is used in making indelible laundry marks. The nitrate has other uses in silver plating and photography. G.L.Bu.

**SILVERSMITH.** See COLONIAL LIFE IN AMERICA (Metalware; illustration, Colonists at Work); REVERE, PAUL; SILVER.

**SILVER STAR.** See DECORATIONS AND MEDALS (Decorations of the United States).

**SILVER STATE.** See NEVADA.

**SILVERWARE.** See GERMAN SILVER; SILVER.

**SILVERY BLUE.** See BUTTERFLY (Kinds of Butterflies); INSECT (color plates, Butterflies).

**SIMCOE, JOHN GRAVES** (1752-1806), was a British soldier and the first lieutenant-governor of Upper Canada. He served from 1791 to 1796. Simcoe was born in Cotterstock, England, and was educated at Oxford University. He joined the British Army in 1771 and was sent to America when the Revolutionary War broke out. After the war, he returned to England and entered politics. He was appointed commander in chief in India, but died before he could take the position. E.R.A.

**SIMEON II, KING.** See BULGARIA (Government).

**SIMEON STYLITES**, *sty LI teez* (388?-459), was the famous saint who lived on top of a stone pillar for thirty years. He also fasted rigorously, and became the spiritual guide of great numbers of pilgrims. He believed that the severity of his life was necessary to call attention to the evil habits of the people of his time. See also ASCETIC; MONASTICISM. F.J.S.

**SIMILE**, *SIM ih lee*, is a figure of speech which is often used in describing or explaining something. It points out a likeness between two different objects, by using a connective word. This connective word is usually *like* or *as*. An example of a simile would be, "He is as cross as a bear today," or "She ran *like* a deer."

Very often a simile becomes so natural that we drop the connecting word. Then the figure of speech becomes a *metaphor*. An example of a simile's becoming a metaphor is "He is *like* a fox" and "He is a fox." T.C.L.

See also FIGURE OF SPEECH; METAPHOR.

**SIMLA.** See INDIA (Cities).

**SIMMONS COLLEGE** is a women's school for vocational training in social work in Boston, Mass. It is privately controlled. Courses lead to B.S. and M.S. degrees. The college was founded in 1899. It has an average enrollment of about 1,500 students.

**SIMMS, WILLIAM GILMORE** (1806-1870), was an American novelist and poet. Many critics rank him second only to Edgar Allan Poe among the Southern writers of the period before the War between the States.

Simms was born in Charleston, S.C. He studied law but did not practice it much. In 1828 he became owner and editor of the *Charleston City Gazette*. Simms was particularly interested in the American Revolutionary period in the South and in Southern biography. L.J.

His Works include the romance of the border, *Guy Rivers*, *Border Beagles*, and *Beauchampe*. Among his best poems are "Atalantis, A Story of the Sea"; "The Swamp Fox"; and "The Lost Pleiad."

**SIMONIDES**, *sy MAHN ih deez*, **OF CEOS** (556-469 B.C.), was a famous Greek lyric poet. He was considered one of the most talented men of ancient times. His best works were triumphal odes and elegies, or poems in praise of the dead. These poems had such sweetness, simplicity, sadness, and power of expression that they were considered as good as the poems of his great rival, Pindar. See PINDAR.

Simonides was born at Ceos. He lived for a long time in Athens, where he was well treated by the tyrant Hipparchus. Later he lived in Thessaly. He wrote many poems about war and heroes and defeated Aeschylus for the prize for the best elegy on the soldiers who fell at Marathon. C.H.O.

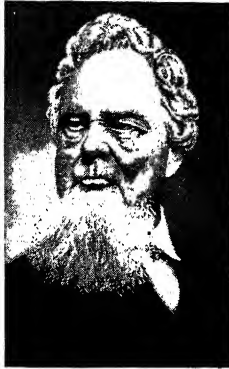
**SIMONOV**, *SI mahn awf*, **CONSTANTINE** (1915- ). See RUSSIAN LITERATURE (Soviet Literature).

**SIMON PETER.** See APOSTLE (Peter).

**SIMONS, MENNO.** See MENNONITE.

**SIMON THE CANANAEAN.** See APOSTLE.

**SIMOOM**, *sih MOOM*, or **SIMOON**. This hot dry wind blows in the Sahara and the Arabian Desert. The simoom often carries with it great clouds of dust which make the sky hazy. It is one of the terrors of the desert, since it rises suddenly and often suffocates men and animals. Travelers have to lie down close to the ground with their heads covered, and the camels burrow their noses into the sand. The simoom may pass in ten minutes, or it may last for hours or even for days. It leaves the desert sand in great drifts like snow after a blizzard. In March, 1901, there was a great African simoom which scattered red and yellow sand and dust throughout Southern Europe. It was even reported that some of the sand fell in England. Simooms are caused by the overheating of the soil and the layers of air next to it. The hot air rises, and cooler currents from all sides flow in, producing the desert whirlwind. E.S.S.



Brown Bros.

William Gilmore Simms wrote historical novels about the old South.

**SIMPLIFIED SPELLING.** See SPELLING.

**SIMPLON PASS.** This is the pass through the Swiss Alps over which Napoleon built a magnificent road in 1800-1806. The highway is considered one of the great feats of modern engineering. It is forty-two miles long, between twenty and thirty feet wide, and is carried over 611 bridges. In some places, it runs through huge tunnels. The pass lies near the frontier of Italy. The name *Simplon* also has been given to the longest railway tunnel in the world (twelve and one-half miles), which is built through the Alps at this point. The pass is 6,592 feet above sea level, while the highest point of the railway tunnel is about 2,300 feet. W.R.McC.

**SIMPLON TUNNEL.** See SIMPLON PASS.

**SIMPSON, JAMES YOUNG, SIR** (1811-1870), was a Scottish doctor who specialized in the problems of childbirth, or obstetrics. In 1847 he discovered the anesthetic qualities of chloroform, and was the first to suggest the use of this drug to relieve the pain of childbirth. A heated argument followed the announcement of his discovery. It ended in Simpson's favor when Queen Victoria gave birth to her seventh child, Prince Leopold, under chloroform.

Simpson was born at Bathgate, Scotland, and studied medicine at the University of Edinburgh, where he became professor of medicine in 1840. V.R.

See also ANESTHESIA; CHLOROFORM.

**SIMPSON COLLEGE** is a coeducational school in Indianola, Iowa. It is controlled by the Methodist Church, but students of all faiths are admitted. Courses are offered in all the major departments, as well as in pre-law, pre dentistry, pre medicine, pre pharmacy, pre engineering and preparation for other professions. The college was founded in 1860 and has an average enrollment of about 550. E.E.V.

**SIMS, WILLIAM SOWDEN** (1858-1936), was an American naval officer. He commanded the American naval forces in European waters during World War I.

Sims was born in Port Hope, Canada, but was educated in the United States. He was graduated from the United States Naval Academy in 1880. From 1897 to 1900 he served as naval attaché to the American embassies in France and Russia. Afterward he was appointed inspector of target practice for the Asiatic squadron and suggested a new system of target practice which greatly improved American naval gunnery. In 1909 Sims took command of the battleship *Minnesota*. In 1913 he was appointed to command the Atlantic torpedo flotilla. When the United States entered World War I, he was promoted to the permanent rank of rear admiral. He was made an admiral in 1918 and retired in 1922. C.L.L.

**SINAI**, *SI ni* (also called HOREB), was the mountain on which Moses received the Law from God. It is thought by some to be Jebel Musa or Jebel Serbal, in the south of the Sinai Peninsula. This peninsula lies between the two arms of the Red Sea, the gulfs of Suez and Akabah. However, we are not sure where the Mount Sinai mentioned in the Bible actually was. Moses stayed upon the mountain forty days, while the Children of Israel camped on the plains below. At the end of this period, he returned with the Ten Commandments, written on tablets of stone (Exodus 19-20, 32-34). See also DECALOGUE; MOSES. W.A.I.

**SINBAD**, or **SINDBAD, THE SAILOR** is one of the storytellers in the *Arabian Nights*. He overhears Hindbad, a poor worker, complaining about his poverty in envy of Sinbad's wealth. Sinbad asks him into his home where he tells the story of his seven voyages about the world. The stories are full of exciting adventure and many difficulties. See also Roc. S.M.S.

**SINCLAIR, HARRY FORD** (1876- ), is an American businessman. In 1901 he founded an oil producing business. He was involved in the so-called "Teapot Dome" oil scandal of 1923 and in 1927 was sentenced to prison for contempt of the United States Senate in refusing to testify before it. He was found not guilty of charges of conspiring with Secretary of the Interior Albert B. Fall to defraud the government.

**SINCLAIR, UPTON BEALL** (1878- ), is a famous American writer. In his youth he became widely known as the "muck-raking" author of *The Jungle*. This novel pointed out the terrible conditions then existing in the



Brown Bros.

**Upton Sinclair**, American writer on social topics

Chicago stockyards. It created such a sensation that President Theodore Roosevelt ordered an investigation of the meat-packing industry and brought about improved conditions.

Sinclair was born in Baltimore, and was educated at the College of the City of New York and at Columbia University. He worked his way through college by writing adventure stories for pulp magazines, and in 1901 wrote his first novel.

Afterward he entered politics and ran unsuccessfully for various offices on the Socialist ticket. In 1934 he ran for governor of California on the Democratic ticket, but was defeated after a colorful campaign. In 1943 Sinclair won the Pulitzer Prize for his novel *Dragon's Teeth*. This book is one of the long series of the semihistorical "Lanny Budd" novels which report events between World Wars I and II. L.C.W.

**His Works** include *The Brass Check*; *The Wet Parade*; *Presidential Agent*; *Between Two Worlds*; and *World's End*.

**SINDIA**, or **SINDHIA**. See **INDIA** (History [Rise of the East India Company]).

**SINDING, CHRISTIAN** (1856-1941), was a Norwegian composer whose music suggests the spirit of northern lands. He was born at Kongsberg, and studied in Leipzig, Dresden, Munich, and Berlin. His most popular composition is "The Rustle of Spring," for piano. Sinding also wrote symphonies, concertos, chamber music, and an opera. G.B.

**SINDRI**, *SIN* *dreh*. See **GNOME**.

**SINIEW**. See **TENDON**.

**SINFONIA**, *SIN* *foh* *NE* *ah*. See **MUSIC** (Types of Music [Music for Orchestra]).

**SINGAPORE**, *SING* *gah* *POHR*, is one of the greatest ports and colonial outposts in the world. It is the gateway from India to the Far East. Ships sailing from India to China, the Netherlands East Indies, or Australia, stop at Singapore to load and unload. Singapore

gets its name from an old Sanskrit word, *Singhapura*, which means *the city of the lion*. The city of Singapore is situated on the southern shore of the island of Singapore, which lies at the tip of the Malay Peninsula.

**The Island** of Singapore covers an area of about 290 square miles. The Strait of Johore, only three quarters of a mile wide, separates the island from Johore on the north. The southern coast line is formed by Singapore Strait. The island is connected with the Malay Peninsula by a causeway, or land bridge, across the Strait of Johore. Near the causeway on the northern shore of the island is a British air and naval base.

The island of Singapore is hilly and tropical. Most of its surface is covered by wild forests, farms, and rubber plantations. Tin is the only important metal found on the island. The soil is not rich, but Chinese farmers have made it very productive through careful cultivation. They raise tropical fruits, vegetables, tapioca, lichee nuts, and rice. Rubber and tin are the chief exports of the island.

Singapore has a hot, moist climate. The island lies only about 75 miles north of the equator, but ocean breezes cool its shores. The rainfall is heavy throughout the year.

The island has 769,216 inhabitants. More than half of these live in the city of Singapore. Over half of the people are Chinese. There also are about 77,000 Malays, 60,000 Indians, and 14,500 Europeans.

**The City** of Singapore is the trading and cultural center of the Malay Peninsula. Singapore has a population of 525,228, mostly Chinese.

In Singapore, Eastern and Western cultures meet and mingle. The city is built around a fine, spacious harbor which has an area of 36 square miles. Docks and warehouses line the port, where ships of all kinds and sizes ride at anchor. Raffles Square is the commercial center of Singapore. A bronze monument to Sir Stamford Raffles, British founder of Singapore, stands in the square. Modern shops, theaters, hotels, and office buildings are built around Raffles Square. Nearby are dignified government buildings.

Singapore has a fine museum and a college, both named for Sir Stamford Raffles. The city has Protestant and Catholic churches, Moslem mosques, and Buddhist temples. The Chinese residents of the city live and work on narrow streets lined with open shops, Chinese signs, and laundry poles. On the outskirts of Singapore are Malay huts built on stilts.

Singapore is a free port. This means that goods can be unloaded, stored, and reshipped without the payment of duty. Many of the exports of southern Asia pass through Singapore on their way to Europe and America. Before World War II, Singapore handled about four fifths of the world's rubber. Tin from the Malay Peninsula was another important export. Singapore's docks receive manufactured goods and other products from Europe and the United States. For its own use, Singapore imports cotton goods, rice, vegetables, fruits, and sugar.

The city also has important industries. They include pineapple canning, soap making, preparing rubber for shipping, and tin smelting. Singapore has the largest tin-smelting company in the world.

## SING A SONG OF SIXPENCE

**History.** Historians know little of the early history of Singapore. The Chinese believe that many hundreds of years ago Singapore was a thriving trading center, and that invaders from Java destroyed the settlement in the 1300's. When the British came, Singapore was only a jungle-covered island, with a small fishing village on the coast. Sir Stamford Raffles, an agent of the East India Company, recognized the importance of the island to British trade. He gained possession of Singapore harbor in 1819 by an agreement with the Sultan of Johore. The entire island came under British control in 1824. In 1826 Singapore became part of the Straits Settlements colony. The city was made the political capital of the colony. Immigrants from China poured in.

The British Government decided to make Singapore a strong naval and air base after World War I. This base was built in the 1930's on the northern shore of the island. The British installed big guns, cut airfields out of the jungle, and placed submarine nets at the mouth of the harbor. A stationary drydock was built, and a floating drydock was brought all the way from England. Singapore became known as "the Gibraltar of the East." Unfortunately, the British prepared only for attack from the sea.

During World War II, Japanese forces marched down the Malay Peninsula from Siam. They took Singapore on February 16, 1942, and the city and island remained in their hands until September, 1945. American and British bombing raids damaged the docks severely during this period.

G.B.C.R.

See also FREE PORT; JOHORE; STRAITS SETTLEMENTS, WORLD WAR II.

**SING A SONG OF SIXPENCE.** See NURSERY RHYME.

**SINGER, ISAAC MERRIT** (1811-1875), designed a sewing machine which came to be used by housewives the world over. His machine perhaps has done more to free women from drudgery, and to clothe the world than any other invention. Singer's idea was neither new nor original. His achievement was rather to make the sewing machine a practical household appliance. He also developed powered machines for garment factories.

Singer was born in Oswego, N.Y. He left home at the age of twelve and became a mechanic. In 1851, while he was working in a machine shop in Boston, a sewing machine happened to be brought in for repairs. Within a few hours Singer sketched an improved model which he patented. Later Elias Howe sued him for stealing his patent, and Singer lost the case. But he made so much money from his design that he could well afford the payments he had to make to Howe.

J.C.R.

See also HOWE, ELIAS; SEWING MACHINE.

**SINGHALESE,** *SING gah* LEEZ. See CEYLON (The People and Their Work).

**SINGING.** Training in singing takes patience and practice. Singers with ordinary voices can not be developed into opera stars just by training. But there are few people who can not be taught to sing at least simple melodies. A more pleasing speaking voice results from voice training.

In singing, the vocal cords are caused to move, or vibrate, by a current of air from the lungs. These vibrations produce sound. Learning to control the muscles used in breathing is very important in singing. Most of



De Cui, Savdars

**Chinese Boy Peddling Cold Drinks on a Singapore Street.** He carries his wares in vacuum bottles mounted on a small cart. Singapore is the "melting pot" of the Far East. Its inhabitants include Englishmen, Malaysians, East Indians, Chinese, and Hindus.

these muscles are in the diaphragm, just below the ribs. The power of the voice may be easily and smoothly regulated through correct use of these muscles.

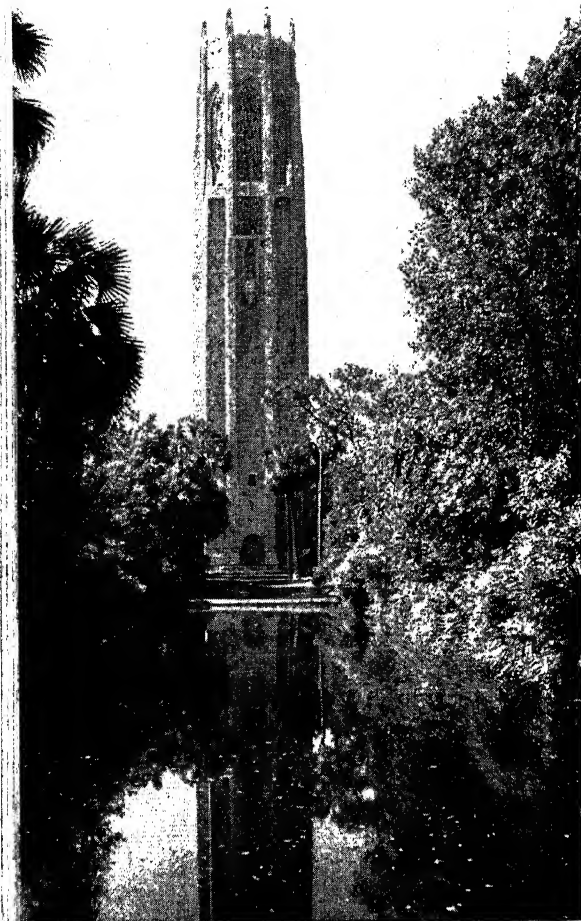
Some songs require singing long phrases, or groups of words, without taking a breath. Others have very high or very low notes. When a singer learns to control the voice so that such singing can be done easily, the voice is said to be "on the breath." It is more pleasing to hear such singing. Throat tension is another consideration in singing. When a throat is "tight," the voice can not make a free, ringing tone. Singing through the nose also is to be avoided. Some people who sing are taught to sing in the mask, or the cavities in the upper middle part of the face, and then erroneously sing through the nose. The best singers sing in the mask.

Song sheets sometimes have the words *messa di voce*, printed in certain places. This means at such a point in the song the voice must increase the tone gradually from very soft, *pianissimo*, to loud, or *fortissimo*, and then back to a soft tone again. Such change requires very exact control of the breath and of the amount of air which is expelled. *Legato* is another word used in song sheets. It means smoothness of the singing voice. To get such smoothness, there must be no break between the notes. Lyric singing, or songs which express certain feelings, are usually sung in this manner.

An octave is a group of eight full notes of the piano. The tones of human voices cover about three such octaves, from the bass D to the soprano B flat. A single voice is not usually able to cover more than two octaves, and the untrained voice averages only twelve notes or tones. There are some unusual voices which can reach more than three octaves.

The voice uses many more notes in singing than in





The Singing Tower at Mountain Lake, Fla., houses a carillon in its lofty belfry. The mellow pealing of the great bells can be heard for a long distance on still days.

talking. The higher the note the voice sings, the tighter the vocal cords become. High notes on a violin are produced in much the same way. The strings are stretched more tightly for the higher notes.

Voices are classified according to *pitch*, or sound. Pitch depends on the length of the vocal cords. Women's voices are higher in pitch than men's because their vocal cords are shorter. A very long cord gives a deep bass voice. This is the lowest division of the singing voice. The other divisions, named in order from low to high pitch, are baritone, tenor, alto, mezzo soprano, and soprano.

Training the voice for singing also includes working for purity of tone, learning to sing clearly and with ease, and enunciating carefully. Enunciation is the way in which parts of words are said, or the degree of carefulness used in pronouncing vowels and consonants. In singing, careful enunciation makes the words more understandable. When consonants are emphasized in singing, it gives the impression of a bigger voice. In all Wagner operas this is very important. Otherwise the voice without accented consonants would not be heard above a tremendous orchestra.

Singing in English is more difficult than in Italian, French, or Spanish. That is because it is hard for the

## SINGMASTER, ELSIE

voice to form English words and musical tones at the same time. German is very difficult also because of the guttural sounds. Perhaps the easiest language to sing is Italian.

**Related Subjects.** The reader is also referred to:

A Cappella	Minnesinger	Operetta
Aria	Music (Through English	Oratorio
Cantata	Music; Types of Music	Voice (with list)
Chorus	[Music for Voices]	Westminster
Folk Music	Opera	Choir

### TYPES OF SONGS

Canon	Hymn	Round
Carol	Madrigal	Spiritual
Chantey		

### WELL-KNOWN SONGS

America the Beautiful	God Bless America
Auld Lang Syne	Home Sweet Home
Battle Hymn of the	Londonderry Air
Republic	National Anthems (with list)
Dixie	

**SINGING GAMES.** See GAME.

**SINGING TOWER** is a beautiful tower, 250 feet high, which stands in a 50-acre park at Mountain Lake, Fla. It contains one of the biggest sets of bell chimes, or carillons, in the world. Edward Bok built it as a gift to the American people. The park is a bird refuge. Milton B. Medary designed the tower, and Samuel Yellin made the lovely brass doors and iron railings. Two marble bridges cross the moat, or ditch, around the tower. Stately palm trees line the pool in front. See also Bok, Edward.

**SINGLE ENTRY.** See BOOKKEEPING (Single-Entry Bookkeeping).

**SINGLE TAX.** Economists have often proposed that governments should raise all needed revenues by a single tax on land. The simplest and clearest statement of this idea was the plan formulated by Henry George, an American journalist and economist.

The single-tax theory holds that rent tends to absorb all values above minimum wages and interest. But the extra value of land results from the presence of people. A few square feet of rocky soil on the point of Manhattan Island are worth a fortune solely because millions of people are crowded into a small area in New York City. This increased value of land is due not to the owner's effort but to population growth and other factors. It is called *unearned increment*. Single taxers argue that since the whole population gives the land its value, the whole population should share it. They urge that the government should, by taxation, take the entire unearned increment from land and use it for the public good.

See also ARDEN, (Dcl.); BENGOUGH, JOHN WILSON; GEORGE, HENRY.

**SINGMASTER, ELSIE** (1879- ), is an American author of realistic stories about the "Pennsylvania Dutch." She also wrote books for young people, including several on historical subjects. She was born in Schuylkill Haven, Pa., and received her education at Radcliffe College.

**Her Works** include *Gettysburg—Stories of the Red Harvest and the Aftermath*; *Emeline*; *A Boy at Gettysburg*; *Stories to Read at Christmas*; *Virginia's Bandit*; and *Rifles for Washington*.

**SING SING** is a state prison at Ossining, N.Y. It originally had a building for women, but now the only women housed in this prison are those who have been condemned to death. The construction of the buildings was started in 1825 with convict labor. The oldest buildings are not well suited to modern prison methods. But a number of new ones have been put up, and the entire prison has been reorganized. Sing Sing is a sort of city in itself, with its own factories, farms, and school. Whenever possible the convicts are given jobs for which they are suited by their training and experience. See also PRISON. A.E.W.

**SINGSPIEL**, *SING SPEEL*. See MUSIC (Types of Music [Music for Voices]).

**SINK** is a term used in the science of geology. It means a large sunken place in the earth, especially a lake which has no outlet.

**SINKIANG**, *sin kyahng*. See TURKESTAN.

**SINN FEIN**, *shin fayn*, was an Irish nationalist society that favored the establishment of an independent Irish Republic. The Gaelic words *Sinn Fein* mean *we ourselves*. Arthur Griffith founded the society in 1906 as a protest against the Nationalist party, which advocated Home Rule and the maintenance of the British connection. The Sinn Feiners advocated a policy of passive resistance in order to compel Britain to grant independence to Ireland. They felt that Irishmen should use the boycott by refusing election to the British Parliament, and by refusing to pay taxes, to serve in the civil and military services, and to recognize the jurisdiction of the courts. If effective this boycott would completely disorganize British rule in Ireland.

At first Sinn Fein received the support of only a few Irishmen, chiefly intellectuals. But popular support came to the society as a result of the Irish crises of 1914 which arose when the third Home Rule was suspended because of the outbreak of World War I. An uprising, led by the Sinn Fein, took place in Dublin during the Easter season in 1916. The "Easter Rebellion" was suppressed by the British but it added to the popularity of the Sinn Fein.

In the elections of 1918 Sinn Fein appeared as a political party. It scored a great success over the Home Rulers. Instead of taking the seats to which they had been elected in the British Parliament, the Sinn Fein members organized an Irish national assembly, called the *Dail*. The leaders of the assembly were Eamon De Valera and Michael Collins. Savage guerilla war broke out between the British and Sinn Fein forces.

In 1920 the British Parliament passed a Home Rule law which provided for two parliaments: one in Belfast with jurisdiction in Northern Ireland and another in Dublin with jurisdiction in Southern Ireland. But Southern Ireland rejected the Home Rule solution, and the struggle continued. The British finally decided on a radical measure to solve the Irish problem. In 1922 Parliament passed a law establishing Southern Ireland as a Dominion, and called it the *Irish Free State*. As a Dominion with a status like that of Canada, it had far more self government than Northern Ireland had with home rule.

Sinn Fein was now in power. A majority of the party accepted Dominion status, but a minority, led by De

Valera, demanded independence. Civil war broke out between the two factions. It was ended by the triumph of the De Valera faction in the elections of 1932. De Valera, now Prime Minister, put through a series of acts that virtually cut the connection between the Irish Free State and Britain. These included the abolition of the oath of allegiance to the king and of the approval of Irish laws by the governor-general.

In 1937 the Dail drew up a constitution which abolished the Irish Free State and established a new political entity, called *Eire*, the ancient name of Ireland. According to this constitution, which was accepted by a referendum, Eire was almost an independent republic. De Valera became President with power to appoint a ministry. Legislative power was vested in the Dail elected by universal suffrage. Sinn Fein was now triumphant, but not completely. Northern Ireland was not part of Eire. J.S.S.

See also COLLINS, MICHAEL; DAIL EIREANN; DE VALERA, EAMON; EIRE.

**SINO-JAPANESE WARS**, another name for CHINESE-JAPANESE WARS. See CHINESE-JAPANESE WARS.

**SINON**. See WOODEN HORSE.

**SINTER**. See METALLURGY.

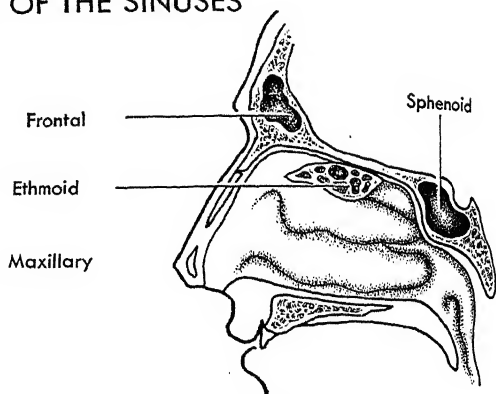
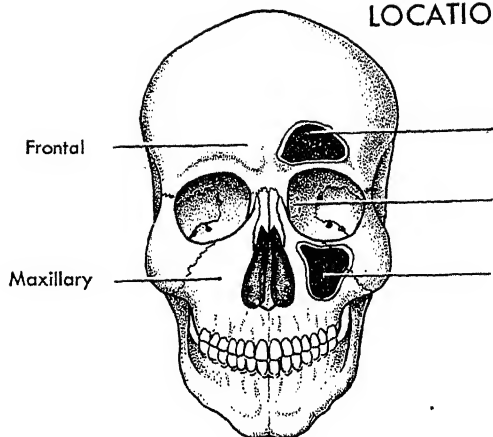
**SINUS**, *SI nus*. The sinuses are small cavities in the skull. They are near the nose, and open into it. There are four pairs of sinuses. The *frontal* sinuses lie in the lower part of the forehead, just above the eyes. The *maxillary* sinuses lie in the cheekbones on either side of the nose. The maxillary sinus also is called the *antrum*. The *ethmoid* group of sinuses lie just above the nasal cavity. The *sphenoidal* sinuses lie behind the ethmoid sinuses in the upper part of the nasal cavity.

As far as is known, the sinuses have no useful function. Because they are filled with air they increase the lightness of the skull, and may make the voice more resonant.

The sinuses are lined with the same kind of membranes as those which line the nose. When the nasal membranes become infected, infection can easily spread to the sinuses. There the infection causes a disease commonly called *sinus trouble* or *sinusitis*. In sinus trouble, the secretions given off by the membranes which line the sinuses become blocked within the sinuses themselves because the entrances to the nasal cavity are swollen shut. This results in pressure which causes pain in the surrounding areas. This pain is often exceedingly uncomfortable, and may occur at the same time every day. Another symptom of sinus trouble may be dizziness, as well as a running nose. Sinus trouble may result from other things besides the common cold, which infects the tissues of the nose. Such diseases as influenza, pneumonia, typhoid fever, scarlet fever, and measles often result in sinus trouble. Allergies often show themselves by an inflammation of the sinuses. Such sinus trouble cannot be corrected until the offending substance is removed. Other factors which may make certain individuals more susceptible to sinus trouble are the climate, dampness, drafts, and smoking.

The treatment of sinus trouble includes rest and liquid diet. Pain relieving drugs are helpful. Sometimes surgery may be used to puncture an antrum and permit proper drainage. Medical science also is experimenting with the use of such drugs as penicillin and gramicidin.

## LOCATION OF THE SINUSES



Sinus trouble is dangerous because it may serve as a focus of infection which spreads to other parts of the body, such as the eye. See also COLD, COMMON. A.B.H.

**SIOUAN**, *SOO an*. See INDIAN, AMERICAN (Languages, Signs, and Smoke Signals).

**SIOUX**, *soo*, is the name of an American Indian tribe which once roamed through the northern prairies. Their own name for themselves was *Dakota*, or *Lakota*. They had many divisions. Some of the Sioux, such as the Yankton and Santee Sioux, were farmers. The Sioux belonged to the Siouan language group, which included many other Indian tribes such as the Osage, Omaha, Missouri, and Catawba.

The best known are the westernmost Sioux, the Teton, who were famous buffalo hunters. As the country filled up, white settlers and gold seekers entered the Sioux hunting grounds and the buffalo were killed off. In 1868 the Teton consented to live on reservations. But they were not used to farming, and their land was not fitted for it. In 1876 they broke out. General George Armstrong Custer and his troops were sent against them. The Sioux managed to surround and kill Custer's whole party at the battle of the Little Big Horn. The government then forced the Sioux to return to their reservations.

In 1890 the Ghost Dance religion brought new hope to the Sioux. This taught that the magic of a dance would bring the buffalo back and make the whites disappear. Hundreds of Sioux gathered for the Ghost Dance. United States troops thought the Indians meant to revolt, and attacked them. Men, women, and children were killed, and the bodies piled into trenches. Since then the Sioux have remained on reservations, and have grown used to their life as farmers and cattlemen. R.M.U.

See also BUFFALO CEREMONIALS; CUSTER, GEORGE A.; INDIAN, AMERICAN (Hunters of the Plains; color plate, Sioux War Bonnet); RACES OF MAN (color plate, American Indians); SITTING BULL.

**SIOUX CITY**, Iowa (population 82,364), is one of the largest livestock markets in the world. It is also an important wholesale distributing center for northwestern Iowa, northern Nebraska, and South Dakota. Sioux City lies on the east side of the Missouri River below the

mouth of the Big Sioux River. Omaha lies about 100 miles south and east.

Sioux City covers an area of about forty-five square miles. It has many attractive streets lined with well-built homes. There are forty parks in the city.

Morningside College (Methodist), Trinity College (for Catholic boys), and Briar Cliff College (for Catholic girls), are among the city's schools.

**Industry.** Sioux City claims to have the largest creamery in the United States, the largest honey-packing plant, the largest popcorn company, and the largest manufacturer of wind-propelled electric generators. Other products of Sioux City factories include meat products, automobile parts, building materials, furniture, metal goods, jewelry, leather goods, farm machinery and tools, livestock serums, and electrical supplies.

**History.** Dr. John K. Cook, who surveyed northwestern Iowa for the Federal Government, laid out the town in 1854 and named it for the Sioux tribe of Indians who lived in the region. During its early years, the town was an outfitting place for prospectors hunting gold in the Black Hills, and also was a government post from which expeditions were sent out against hostile Indians.

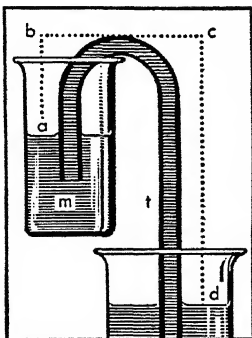
In 1880, when the population was 7,360, Sioux City began to grow at a faster rate than any other city in the United States. By 1890 the population numbered 37,800. The city has a commission form of government. J.E.Br.

See also COMMISSION FORM OF GOVERNMENT.

**SIOUX FALLS**, S.D. (population 40,832), is the largest city and the chief manufacturing and distributing center of South Dakota. The city lies at the falls of the Big Sioux River, near the meeting point of the Minnesota, Iowa, and South Dakota boundaries. Sioux Falls factories produce packed meats, crackers, processed dairy foods, and crushed rock. Five railway lines serve the city. The first settlers were driven out by the Indians in 1857. But the site of the city was soon settled again. Sioux Falls is the home of Augustana College, Sioux Falls College, a state school for the deaf, and the state penitentiary. An army airfield was located here during World War II.

**SIOUX STATE.** See NORTH DAKOTA.

**SIPHON**, *SI fahn*. A siphon is a bent tube with unequal arms which is used to carry a liquid from a higher level to a lower level. As shown in the accompanying figure, the tube is entirely filled with liquid and the short arm is inserted in the container at the higher level. The liquid (*m*) in this container will then flow through the tube (*t*) to the container at the lower level. This is due to the pressure of the air on the surface (*a*) of the liquid. This pressure is approximately 15 pounds per square inch, which is the atmospheric pressure at sea level. The liquid will continue to flow as long as the pressure on *a* is greater than the weight of the liquid from *a* to *b*. The liquid will stop flowing as soon as the surface *d* is raised to the level of *a*, and the distance *ab* will be equal to the distance *cd*. If the level *d* is raised above *a*, the water will flow backwards into the higher container.



**Principle of the Siphon**  
The tube (*t*) is the siphon. The operation is further explained in the accompanying text.

Because it depends upon air pressure, a water siphon will not work at sea level if the top of the bend is more than 34 feet above the level *a*. For best use, the height should not be more than 26 feet.

E.A.FE.

**SIPHONAPTERA**, *sy foh NAP ter ah*. See INSECT (Classifying the Insects).

**SIPHUNCLE**, *SI fung kl*, or **SIPHON**. See OCTOPUS.

**SIQUEIROS**, see *KEE ee rohs*, **DAVID ALFARO** (1898-), is one of the leaders in the modern art movement in Mexico. He developed a new technique for outdoor murals. He painted many small canvases as well as frescoes and exhibited his works several times in the United States. Besides his work as an artist, Siqueiros became a tireless labor leader and fought to obtain better working conditions for miners.

Siqueiros was born in Chihuahua and studied art in the National School of Fine Arts in Mexico City. He joined Venustiano Carranza's forces in the revolution of 1910. Carranza later sent him to study in Europe. He was active in organizing the Painters' Syndicate. In 1928, he went to the Soviet Union as representative of several workers' unions. At the outbreak of the Spanish Civil War he went to Spain and became an officer in the Loyalist army.

V.CO.

**SIRACUSA**, see *rah KOO zah*. See SYRACUSE.

**SIRAJ-UD-DULA**, see *RAHJ-ood-DOU lah*, or **SURAJAH DOWLAH** (1728?-1757). See BLACK HOLE OF CALCUTTA.

**SIREN**, *SI ren*. The siren is an instrument used to give warning signals. Sirens called *fog horns* give fog signals at lighthouse stations. Large fog horns can be heard twenty-five or thirty miles away. Fire trucks and police cars use sirens to warn traffic out of the way. Sirens were used in World War II to warn of approaching air raids.

The most common siren consists of two small perforated cylinders, one inside the other. The outer cylinder can be revolved by turning a crank or some other device.

Another mechanism forces air through the cylinders. The holes in the two cylinders are cut at an oblique slant, and are in lines, circling the cylinders. When the outer cylinder is revolved, it lets a puff of steam or air through the holes every time the holes in the two cylinders are opposite each other.

As the cylinder is turned faster, the puffs become more frequent, until they merge into one clear, continuous sound. The more rapidly the cylinder is turned, the higher the sound. For example, if there are thirty holes in each cylinder and the outer cylinder is revolved 15 times per second, the number of puffs, or vibrations would be 15 times 30, or 450 vibrations per second. The more numerous the vibrations, the higher the pitch of any sound.

E.L.S.W.

**SIREN** was the name given to three sea nymphs who lived on an island. According to Greek mythology, their singing drew sailors to their shores. Then the men would forget home and friends, and at last starve to death.

Circe the sorceress warned Ulysses of the danger of the Sirens. He put wax in his sailors' ears so they could not hear the song. Then he had them tie him to the mast. Ulysses listened to them, but could not go to them. The Sirens killed themselves because they had failed. See also ULYSSES.

P.CO.

**SIRENIA**, *sy RE nih ah*, is the name of an order of mammals that live in the water. The only living species of the sirenia are the dugongs and manatees. These mammals have a rounded head, and an almost hairless, seal-shaped body. They have no hind limbs. Their forelimbs are paddle-shaped and are used only as swimming organs. The tail is compressed and expanded from side to side. Sirenians feed on grasses on banks of streams or on bottom-growing plants in shallow water two or more miles offshore. These mammals are found in bayous, estuaries, lagoons, swamps, and rivers. They are never seen far out in the ocean. Sometimes some of them may be cast on land by the tide. Little is known of their origin and their relation to other mammals. See also DUGONG; SEA COW.

R.KEL.

**SIRIUS**, *SIHR ih us*. See SHIP (Ocean Steamships).

**SIRIUS**, or the **DOG STAR**, is the brightest star in the heavens. It is one of the stars nearest to earth, but it is still so far away that its light takes nine years to reach the earth. You can see the Dog Star by looking along an imaginary line pointing southward through Orion's belt. The Dog Star is the head of the constellation Canis Major, or Great Dog.

Sirius is a star of the first magnitude, and radiates thirty times as much light as the sun. It has a companion star which was discovered by astronomers in 1862. This star's gravity explained the fact that Sirius seemed to move in a wavy line. The two stars move around each other as they travel through space. The companion star is one of the most remarkable stars in the sky, for the material in it is 50,000 times as heavy as water. A cubic foot of material from this planet would weigh about 1,500 tons.

The Dog Star's companion was the first *white dwarf* star discovered. Many more have since been found some with densities 500,000 times that of water.

The unique properties of Sirius have furnished one of the important proofs of Einstein's Theory of Relativity

The shifts in the spectral lines of light given off by the star bear out Einstein's predictions. The great density of Sirius is supposed to be caused by the stripping of electrons from its atoms, which are packed tightly together. See also CANIS MAJOR. G.A.F., Jr.

**SIROCCO**, *sih RAHK koh*, is the Italian name given to two different types of southeast winds which are frequent in countries on the north side of the Mediterranean Sea. Both winds are warm because they come from warm regions. But one is a damp wind that usually comes before a rain, while the other is dry and carries dust from the Sahara far to the south. When this type of sirocco blows, the sky is dark with fine sand which burns the skin and parches the throat. It whips Sicily violently and is similar to, though less violent than, the simoom of the desert. Norman Douglas in his novel, *South Wind*, describes the effect which this dry sirocco has upon human beings. The term *sirocco* is now applied to certain other unseasonably warm winds. E.S.S.

**SIRUP**, or **SYRUP**. See CORN (Uses of Corn); MAPLE SUGAR; SORGHUM; SUGAR (Cane Sugar).

**SISAL**, *SI sal*, or *SE sahl*. The long, swordlike leaves of this tropical plant yield a valuable fiber which is yellow-white in color and strong and lustrous. Sisal is often called *sisal hemp*. There are several different plants that yield fiber bearing the name sisal, but the two of greatest commercial importance are *Agave fourcroydes* and *Agave sisalana*. *Agave fourcroydes* (sometimes called *henequen*), is used chiefly for binder and baler twine. *Agave sisalana* is used principally for rope and cordage. Sisal originated in the peninsula of Yucatan. Though



Ewing Galloway

Cutting the Agave Plant to Get Sisal Fiber which is left after the pulp is removed. The natives of the Kikuyu tribe in British East Africa cultivate the plant for export.

still cultivated there, the plant also is raised for trade in several of the British colonies of Africa and in the East and West Indies.

Sisal fiber is gathered by cutting the leaves at the base and removing the spine from the top. These leaves are cut two or three times a year. It takes from four to seven years for the sisal plant to grow to full maturity. The cut leaves are fed into a machine called a *decorticator* which strips off the pulp and cleans the fiber. It takes about one thousand of these leaves to produce sixty pounds of fiber. D.G.

**SISERA**, *SIS er ah*. See TABOR, MOUNT.

**SISKIN, PINE**. See PINE SISKIN.

**SISTER OF CHARITY**. A number of communities of women in the Roman Catholic Church are called *Sisters of Charity*. All are devoted to the care and education of the sick, the poor, the aged, or the orphaned. Members of all these groups are bound by a vow of chastity which excludes marriage. Each group is known by its special gown or habit. Usually this is a loose robe of black, relieved at the throat and about the face by a touch of white. The first organization was established in France by Saint Vincent de Paul in 1629. Today these societies are among the most highly appreciated organizations within the Church. Members have been spared during religious conflicts because of their self-sacrificing lives and their care of the needy.

The American Sisters of Charity was founded in 1813 by Elizabeth Ann Bayley Seton, better known as Mother Seton. She has been given the title of patroness of the American parochial schools. Since 1931 steps have been taken toward the canonization of Mother Seton. F.J.S.

**SISTER OF MERCY**. The Sisters of Mercy are societies of women whose mission is to nurse the sick, visit prisoners, protect women in distress, and educate girls. In the Roman Catholic Church, the name belongs especially to the congregation of Our Lady of Mercy. This Catholic society was founded in Dublin in 1827. Its founder and first mother superior was Catherine McAuley (Sister Mary Catherine). The first house of the society in North America was established in Pittsburgh, Pa., in 1843. Now there are communities of these Sisters in all parts of the world. Each convent was at first a separate organization subject to the bishop of the locality. In the United States there has been since 1929 a more centralized organization with a superior general. The individual convents are free to enter this new arrangement if they choose. The habit is a flowing black robe with long, loose sleeves. Its white hood with black or white veil is replaced by a bonnet for street wear. F.J.S.

**SISTERS OF THE POOR, LITTLE**. See LITTLE SISTERS OF THE POOR.

**SISTINE CHAPEL**. This is a famous chapel in the palace of the Vatican at Rome. It was erected by Pope Sixtus IV in 1473. The chief papal ceremonies take place in this chapel. Canonizations and more public ceremonies are held in St. Peter's. The chapel also is used by the cardinals for the voting by which they elect a new Pope.

The Sistine Chapel is a simple building, 134 feet long by 44 feet wide, and 85 feet high. But it has on its walls and ceiling some examples of the greatest art ever pro-



## SISTINE MADONNA

duced in the Western World. Brilliant artists of the Renaissance period decorated the walls with paintings that tell the story of Moses and Christ. On the ceiling there are magnificent Biblical stories painted by the great artist, Michelangelo. It took him four and a half years of constant work to complete this ceiling. Its stories tell the history of the creation of the world, the fall of man, and the flood. On the wall above the altar is the "Last Judgment", a wonderful painting 60 feet high and 30 feet broad. Michelangelo began it when he was 60 and worked on it eight years. Its beauty has been somewhat damaged by dust, and by the smoke from burning incense.

The most famous of all the paintings in the Sistine Chapel is in the center of the ceiling. It is called the "Creation of Man and Woman." K.J.C.

See also MICHELANGELO BUONARROTI.

**SISTINE MADONNA.** See MADONNA AND CHILD; RAPHAEL.

**SISYPHUS**, *SIS ih fús*, was a king of Corinth in Greek mythology. He was the most tricky of men, and his schemes puzzled even the gods.

Zeus became angry at him when Sisyphus tried to stop him from kidnaping a woman. Zeus sent Death to punish him, but Sisyphus tricked Death and tied him with chains. There was happiness in all parts of the earth, because no man died while Death was bound.

Ares (Mars) freed Death and gave Sisyphus into his power. Sisyphus secretly told his wife to bury him without the usual funeral ceremonies. He died and went to the Lower World. Then Sisyphus complained to Pluto that he had not been buried as he should. He begged Pluto to let him go back and punish his wife. Pluto let him go, and then Sisyphus would not return.

Hermes (Mercury) at last took him back to Hades. Pluto set Sisyphus to rolling a huge stone to the top of a high hill. But the stone would roll back down just as he reached the top. He would have to begin all over again, and his task was never finished. P.COL.

**SIT-DOWN STRIKE.** See STRIKE.

**SITKA**, Alaska (population 1,987), is a lumbering, mining, and canning center. It was once known as Archangel. The city lies on the western coast of Baranof Island, about 160 miles southwest of Juneau. Its climate is mild and wet. About 1,400 white people live in Sitka. The other inhabitants are mostly Indians and persons of mixed blood. Sitka was the capital of Alaska until 1912. An orthodox church which was built when Russia owned Alaska still stands in Sitka. It contains many ancient and valuable pictures and icons. A.J.D.

**SITKA NATIONAL MONUMENT.** See NATIONAL MONUMENT.

**SITTER, WILLEM DE** (1872-1934), was a Dutch astronomer. He was born at Sneek, The Netherlands, and was educated at the University of Groningen. He spent two years at the Cape Observatory, South Africa, and then returned to Groningen in 1900. In 1908 Sitter became professor of astronomy at the University of Leiden. Later he was made director of the Leiden Observatory, a small institution which he developed into one of the greatest in Europe.

Sitter was a lifelong friend of Albert Einstein. He studied the color differences of stars and satellites of the

## SIVA

planet Jupiter, but he is most famous for his ideas based on Einstein's theory of relativity. Sitter believed that the universe began about five billion years ago and grew to its present diameter of more than two billion light years. He also estimated that the universe contains about eighty billion galaxies like the Milky Way, with an enormous number of stars in each galaxy. C.L.F.

**SITTING BULL** (1834?-1890) was a famous tribal leader and holy man of the Hunkpapa Sioux Indians. He is often given credit for leading the Indian warriors at the Battle of the Little Big Horn on June 25, 1876, in which a third of General George Custer's Seventh Cavalry was wiped out. Actually, Crazy Horse was the Sioux leader in that battle. Sitting Bull acted only as the holy man who "made medicine" for victory.



**Sitting Bull** led the Indians against the white invaders of Indian territory.

Sitting Bull was born on the Grand River in what is now the northern part of South Dakota. As a boy, he was called Jumping Badger, but he was given his father's name at the age of fourteen after he had shown great courage in a raid against the Crow Indians. After 1860, Sitting Bull took an active part in the wars against the white men who were invading the Indian territory.

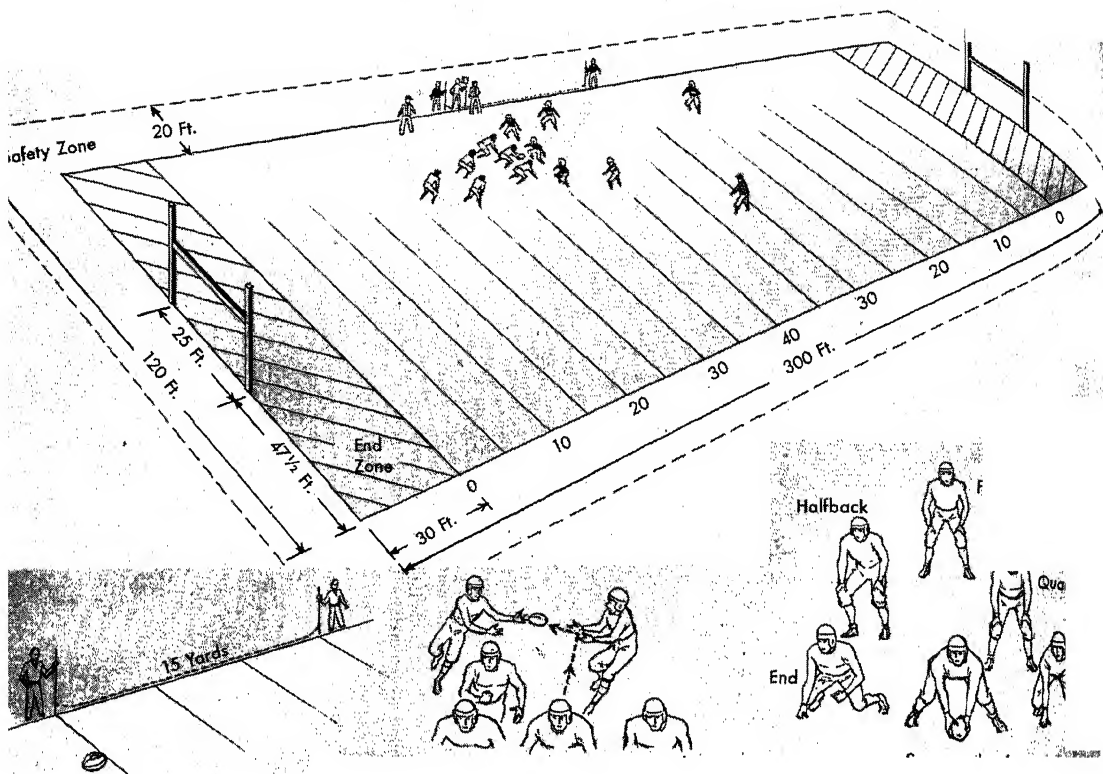
After the Battle of the Little Big Horn, Sitting Bull escaped into Canada with some of his followers. He did not return until 1880, when he surrendered to American troops. Sitting Bull remained a prisoner at Fort Randall until 1883. After he was freed, he returned to his home in the Standing Rock Reservation in South Dakota. During the late 1880's, the Indian chief traveled with "Buffalo Bill" Cody's circus. During the Ghost Dance trouble of 1890, he was suspected of urging the Indians to renew their war on the white men. Indian policemen were sent to arrest him and he was killed while resisting arrest. From the point of view of the Indians, Sitting Bull was a great patriot and wise man. J.G.N.

See also CUSTER, GEORGE A.

**SITWELL, EDITH** (1887- ). See ENGLISH LITERATURE (Twentieth Century).

**SITZKRIEG.** See WORLD WAR II. (Sitzkrieg in the West).

**SIVA**, *SEE vah*, is the third god in the Hindu trinity: Brahma, Vishnu, Siva. Siva was originally the god of storms and destructive forces. Today his wife, Kali, has these powers. She is thought of as bringing life, death, and life after death. The name *Siva* means *kind*. Siva restores what he destroys that man may live again. Siva looks toward eternal truths, and ignores the fleeting aspects of physical life. Thus he has destroyed selfishness, and has become the god of happiness and dancing. He represents the freedom and joy which inspire creative artists. See BRAHMA; VISHNU. G.N.MAY.



**SIWA**, *SE wah*. See OASIS.

**SIX-MAN FOOTBALL** is a variation of football which has become popular. It is played chiefly by schools which do not have enough men for regular football teams. A six-man team plays without the *two* guards, the *two* tackles, and *one* back of a regular eleven-man football team. Its rules are slightly different from those of regular football. Before any running play is made, the ball must be passed once. This rule makes the game largely a passing game. Any man on the team may catch a pass. Scoring is the same as in football except that a successful point after a touchdown scores two points. Field goals score four points.

The game is played on a slightly smaller field than a regulation gridiron. It lasts forty minutes. See also FOOTBALL. J.S.K.

**SIX NATIONS**. See FIVE NATIONS.

**SIXPENCE** is a standard silver coin in Great Britain. It is worth half a shilling, or about ten cents in United States money. J.CoP.

**SIX PER-CENT METHOD**. See INTEREST (Methods of Calculating).

**SIXTE**, *sikst*. See FENCING.

**SIXTUS** was the name of five Popes of the Roman Catholic Church. Most important were the last two.

**Sixtus IV** (1414-1484), was elected Pope on the death of Paul II in 1471. He was born Francesco della Rovere, of a humble family. A member of the Franciscan order, he was made a cardinal in 1467. His most famous memo-

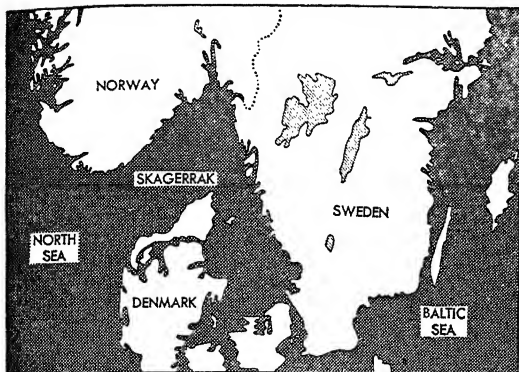
rial is the Sistine Chapel. Sixtus IV did much to promote the Vatican Library and scholarship in general. He worked without success for a crusade against the Turks and also to reconcile the Russian Church with Rome. His worst blunders were overly favoring his nephews and meddling in the quarrels between the Italian states.

**Sixtus V** (1521-1590), was Pope from 1585 to 1590. He was a swineherd before gaining fame as a preacher in the Dominican brotherhood. He was created a bishop in 1566 and a cardinal in 1570. A zealous reformer, he fought to rid Rome of its bands of robbers and outlaws. As a result, his name is still the synonym for speedy justice against wrongdoers. He strove to advance the cause of the Church as against the new Protestantism, but protested the excesses of the Inquisition under Philip II. It was he who blessed the Spanish Armada when it set out against England. Sixtus was a builder of churches and colleges, the Lateran Palace, and the Vatican Library. His administrative changes included fixing the membership of the College of Cardinals at seventy, reorganizing the congregations and increasing their number. Though he did not have the sympathy of the people of his time, his achievements have won him rank with the greatest of the Popes. F.J.S.

See also POPE.

**SIZING**. See DRESSMAKING (Materials); PAPER (Special Kinds of Paper).

**SKAGERRAK**, *SKAHG* or *RAHK*. The Skagerrak is a broad arm of the North Sea, which forms the border of Norway and Sweden to the north and separates them from Jutland (or Denmark) on the south. The name is



Location Map of the Skagerrak

often spelled *Skager-Rak* or *Skagerrak*. The Skagerrak is about 130 miles long. It is the connecting link between the North Sea and the Kattegat. The two channels form the entrance into the Baltic Sea. Along the shores of Jutland there are no good harbors for ships, since the coast is lined with dangerous sand banks. But along Norway, eighty miles away, there are many good harbors. In the Norwegian Channel, the water is more than 2,000 feet deep.

H.U.S.

**SKAGIT, SKAG it, RIVER.** See WASHINGTON (Rivers and Lakes).

**SKAGWAY.** See KLONDIKE.

**SKALD**, *skawld*, or **SCALD**, is a name given to an ancient Scandinavian poet or minstrel. The skald lived at the court of some prince. For many generations there were skalds who composed poems about living heroes and warriors, or about the ancestors of their princes. The skalds were usually well educated and knew all the forms and traditions of Norse poetry. It was not until about the middle 1300's that their verse began to be recorded. Folk poets, who composed roughly and without rules, were not called skalds. In Norway there were skalds as early as the 800's. The latest ones lived late in the 1200's. See also EDDA.

T.P.C.

**SKATE** is the name of a family of flat fishes, the *Rajidae*. The skate may be anywhere from 1 to 4 feet long and may weigh as much as 100 pounds. The skate has two large fins on the sides of the body. These fins are so large that the fish is almost as broad as it is long. The fins have a round edge and form a sort of a disk with the body. The skate has a slender tail which does not help the fish move forward, but is used as a rudder. The skate makes its home on the sandy and muddy bottoms along shores, in bays, or in deep water. It eats snails, mussels, clams, crabs, and other fish. The skate usually lays egg cases on the bottom. Sometimes during storms the egg cases are cast upon the shore where they are picked up by fishermen. These egg cases are sometimes called *mermaids' purses*.

Most kinds of skate are sold as food. One of the best-known species is the *common*, or *summer*, skate, which is found along the Atlantic Coast of North America. The common skate is about one or two feet in length. A larger skate which lives along the Atlantic Coast is the *barn-door* skate. This species may reach a length of about four feet. The *big skate* is another species which is found along the Pacific Coast.

L.P.Sc.

**Classification.** The skates belong to the genus *Raja*. The common skate is *Raja erinacea*; the barn-door is *R. laevis*; and the big skate is *R. binoculata*.

**SKATING** as a sport dates back to the earliest days. The early skater bound a bone to his foot and used a staff to help him slide over the ice. The modern skate is a steel blade, usually fastened to a specially built skating shoe. A blade may be made for special purposes, such as straightaway speeding, figure or fancy skating, or for the game of ice hockey. The highest speed can be made on a light, long, all-metal blade. The rocker-shape blade is best suited for fancy skating. Hockey is played on a blade somewhat shorter and thicker than that of a racing skate. The roller skate, which can be used on any smooth solid surface other than ice, has wheels instead of blades.

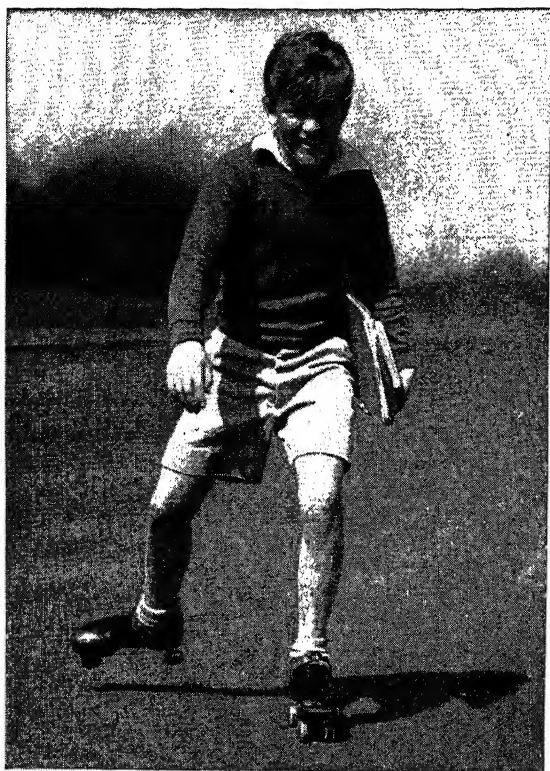
Skating has been popular for hundreds of years among the people of northern countries. It was first developed by the Scandinavians, Finns, and Dutch. One of the most famous children's books from The Netherlands, *Hans Brinker*; or, *The Silver Skates*, concerns skating and its great popularity among the Dutch people.

During the past hundred years, speed races and



Museum of Natural History

**The Common Skate** found off America's East Coast has a body well fitted for life in the water. Its body is thickest in the middle and tapers gradually to the outer edges. The eyes are deep-set behind grooves.



H. Armstrong Roberts

#### Roller Skating Is a Healthful Form of Recreation

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Some of the technical names of fancy skating figures are *edges*, *eights*, *serpentines*, *threes*, *loops*, *brackets*, *counters*, and *rockers*, with their variations and combinations. Dance patterns set to music are also featured in figure skating. The development of artificial ice has brought skating to many places where warm weather would not permit the sport before.

Speed skating has been a feature of North American sports for more than fifty years. Canada, where ice hockey is the national game, organized speed skating sometime before the United States did. Today races are held in distances from fifty yards up to five miles. International contests have shown Americans and Canadians to be among the best sprinters in the world. But, as in running, the Scandinavians are the fastest skaters over longer distances.

E.D.M.

See also HOBBY (Books about Hobbies); HOME LIFE

(color plate, Winter Fun); SAFETY (color plate, Safety at Play).

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**SKEE**, a variant of *ski*. See **SKIING**.

**SKEENA RIVER** is one of the many short streams which flow westward across British Columbia into the Pacific Ocean. The course of the Skeena is about 93 miles long, and it drains an area of about 19,300 square miles. This river is one of the greatest fishing grounds in the world for salmon. The Skeena fisheries are the most valuable in British Columbia except for those of the Fraser River.

The Skeena rises in the north-central part of British Columbia. At one point in its upper course the Skeena is less than twenty miles from the headwaters of the Finlay, the principal tributary of the Peace River. The Skeena flows in a general southwesterly direction, cuts a path across the Coast Range, and empties into the Pacific Ocean about ten miles south of the city of Prince Rupert.

L.D., Jr.

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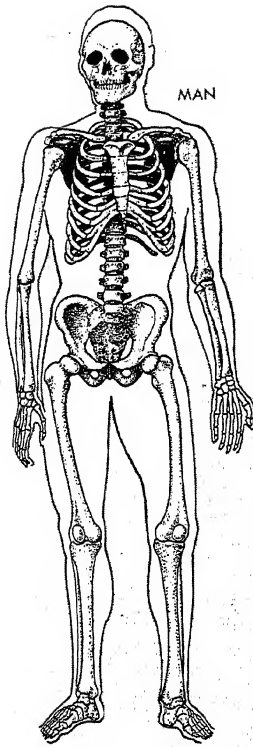
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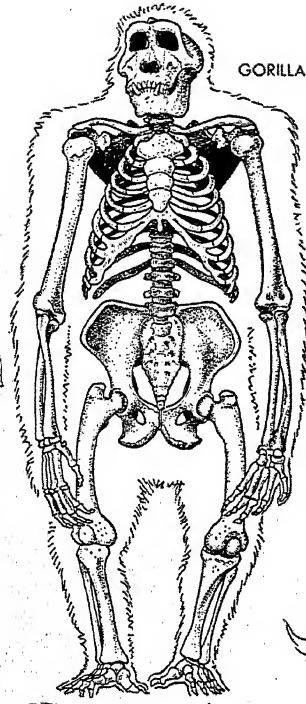
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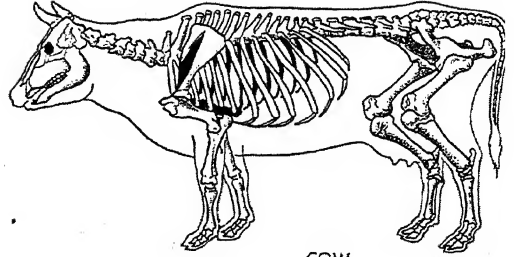
## TYPES OF SKELETONS



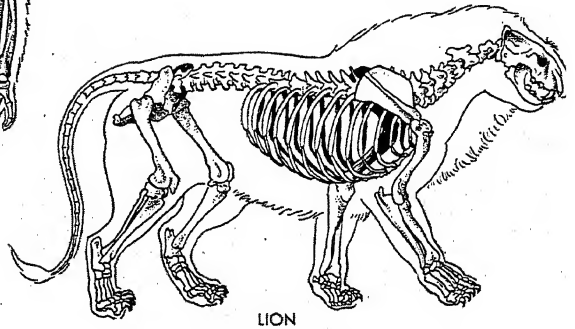
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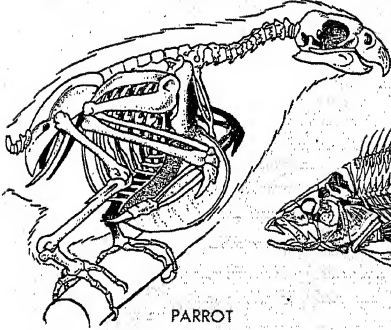
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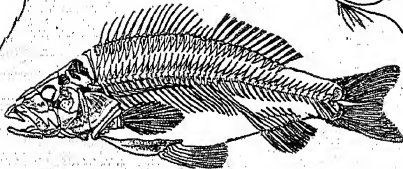
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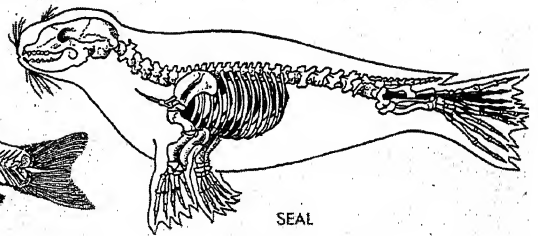
LION



PARROT



PERCH



SEAL

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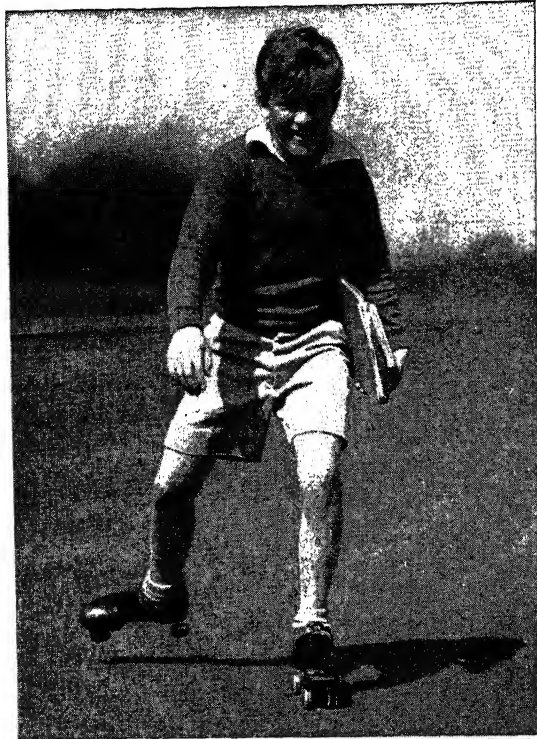
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The human skeleton is often said to be made up of about 200 separate bones. Actually such a statement is misleading, for most of the bones as we may see them on a mounted skeleton are made up of a number of smaller bones. These bones gradually fuse together as a person grows older.

Bones are attached to neighboring bones by joints. There are immovable joints, as in the skull, and movable joints, as in the arms and legs. The bones are fitted together and held in place by strong bands of flexible tissue called *ligaments*. The human skeleton is divided into two main divisions. One division of the human skeleton is called the *axial skeleton* and the other is called the *appendicular skeleton*.

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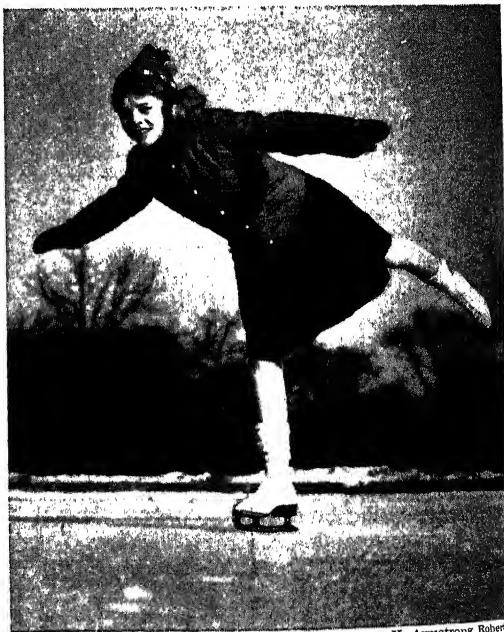
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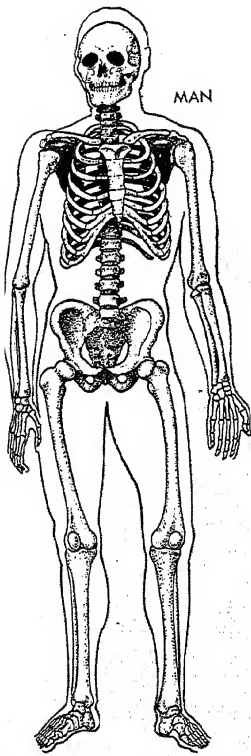
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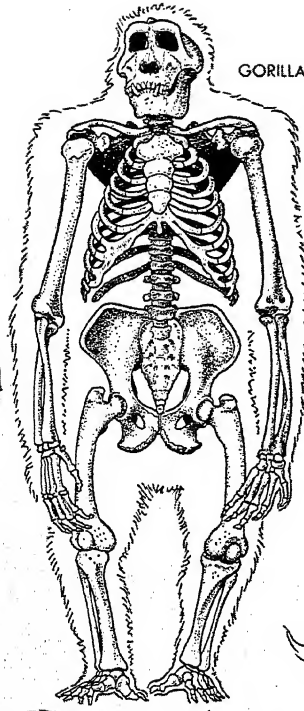
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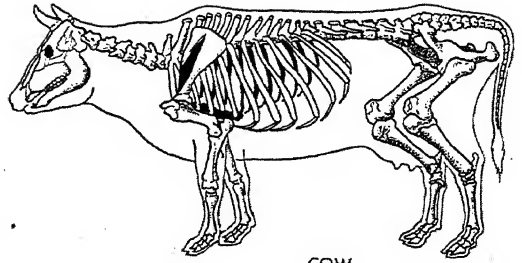
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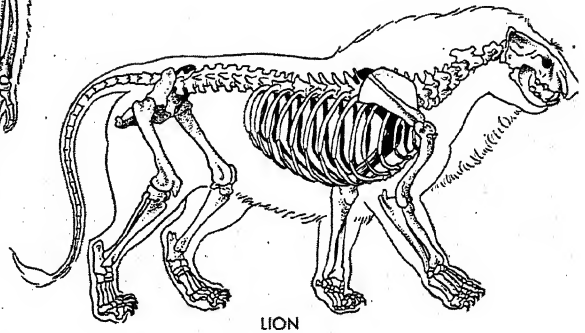
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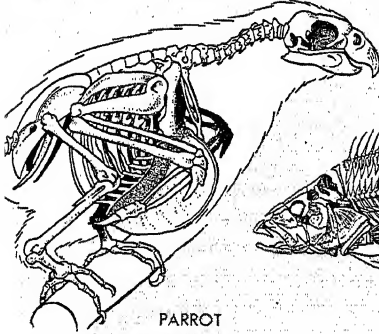
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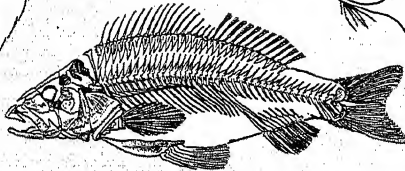
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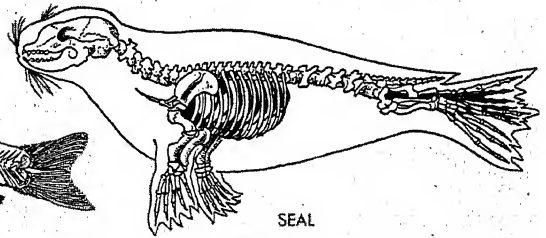
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and act as a bellows box for the breathing process.

The five *lumbar* vertebrae are in the lower part of the back. Below the last lumbar vertebra is the *sacrum*. This is made up of five separate bones in babies. In adults, however, the bones have grown together into one solid structure. At the very bottom of the spinal column is the *coccyx*. In early life this is made up of four bones. In adults these four bones have grown together to form a single bone. The sacrum and the coccyx are regarded as part of the spinal column. At the top end of the spinal column is the skull. The spinal column is joined to the pelvis, the front bones of which meet to form the *pubis*.

The **Appendicular Skeleton** consists of the bones of the arms and legs. The arm is divisible into shoulder blade, *humerus* or upper arm, forearm, wrist bones, and hand. The *shoulder blade* or girdle, also called the *pectoral arch*, is made up of the *scapula*. The two scapulae are attached to the axial skeleton by means of movable collar bones, or *clavicles*. The leg bones are made up of hip, thigh, lower leg, ankle, and foot bones. The hip bones of both sides are fused together and anchored to the sacrum.

The skeletons of all backboned animals are basically very much alike. There are two limbs arranged in pairs, front and hind limbs. There are no more bones in a giraffe's neck than in a mouse's neck. Most backboned animals run about on all fours. Some scientists believe that the upright position of man is a somewhat unnatural position, and that the human backbone is not as yet very well designed for an upright position. Animals without backbones, such as insects and lobsters, often have hard outer body coverings which serve much the same purpose as the inner skeleton of backboned animals.

A.B.H.

**Related Subjects.** The reader is also referred to:

Arm	Hip	Rib
Bone	Joint	Shoulder
Collarbone	Leg	Skull
Foot	Pelvis	Spine
Hand		

**SKELTON, JOHN** (1460?-1529), was one of the early

**Brisk Winter Weather and a Snowy Slope** combine to provide skiers with a day of invigorating sport and exercise.

Harold M. Lambert



poets laureate of England. Most of his verse is satire on the government and the Church.

**SKEP.** See BEE (Beekeeping).

**SKEPTICISM** is a philosophy which states that no knowledge is certain. Some skeptics doubt everything which can not be proved by the evidence of the senses. The first skeptics were the Sophists of ancient Greece. Modern skeptics include the Scottish philosopher, David Hume.

**SKETCH.** See FICTION (Short Story).

**SKETCH AND SKETCHING.** See HOBBY (Books about Hobbies [Drawing and Sketching]).

**SKEWBACK, SKU BACK.** See BRIDGE (The Arch Principle).

**SKIDDING.** See CENTRIPETAL FORCE.

**SKIDMORE COLLEGE** is a privately controlled liberal arts school for women at Saratoga Springs, N.Y. Courses are offered in liberal arts, business and commercial science, art, dramatic art, home economics, music, nursing, and physical education. Skidmore was founded in 1911 and received its present name in 1922. The average enrollment is about 800.

**SKIFF.** See BOATS AND BOATING.

**SKIING, SKEE ing,** is a winter sport which comes from man's oldest method of travel on snow and ice. The name comes from the Norwegian *ski*, the wooden runner used for walking and coasting over snow. Skis are from three to five inches wide and from five to eight feet long. They are attached to the feet by means of leather straps or by metal bindings which permit the heels to rise and fall as in walking. Skiers generally carry two poles to help them keep their balance and to aid in walking up hills. Skis are not so useful as snowshoes in forest lands. In open country they have great advantages, especially in speed.

Skiing has grown in popularity as a healthful exercise in countries where snow is plentiful. Ski meets are held every year in Great Britain, Switzerland, the United States, Canada, and the Scandinavian countries. They are governed by the rules of the International Federation of Skiing. The rules cover the position, style, and grace of the skier, and his success in avoiding falls. Contests include long and short runs and feats of jumping. Jumps are made from a takeoff midway on a hill. The skier sails off into the air at tremendous speed and he soars far over space as he balances and hunches himself forward so as to alight as far down the slope as possible. When a hill can not be used, a high, wooden slide is built. Sometimes the slide is built on the top of a hill in order to increase the speed of the take off. Often mechanical tows return the skiers to the top of the runway after each jump.

The world's ski-jump record, made in 1939 by Joseph Bradl of Austria, is 3,50.96 feet.

Other ski contests include the *slalom*, a zigzag race over downhill trails. This requires expert control of turns and stops. A race on ice or road in which the skiers are pulled by horses is called *skijoring*. The *herringbone* and *step* climbs are methods of ascending hills. The *Christiania* and *telemark* turns are used to execute sudden changes of direction from the course a skier is traveling.

Skis were first adapted for military use by the Swedes

in 1542. Ski troops were used in the Russo-Finnish war of 1940 and in World War II.

E.D.M.

See also HOBBY (Books about Hobbies).

**SKIMMER**, or **SCISSORBILL**, is a bird which is related to the gulls and terns. The name *skimmer* comes from its habit of skimming rapidly along the surface of the water. It holds its beak open and keeps the lower part of it beneath the surface, scooping up insects, small fish, shrimp, and other small animals. The name *scissorbill* comes from its thin, bladelike bill, which has the lower part much longer than the upper.

The skimmer holds its body at an angle while flying, to keep its wings from touching the water. There are



The Black Skimmer of North America is found along the Gulf of Mexico and the South Atlantic coastal states. Its bill is thin and flat like a pair of shears.

three species, the one found in America being called the *black skimmer*, or *black scissorbill*. It is black above, and white underneath its body. It makes its nest in a hollow in the sand along the shore, and lays three to five eggs. The eggs are white, buffy white, or greenish with many chocolate-colored blotches.

A.W.

**Classification.** Skimmers make up the family *Rynchopidae*. The black skimmer is *Rynchops nigra*.

**SKIN.** The skin is one of the largest organs of the human body. If the skin of an adult were spread out flat, it would cover about eighteen square feet. The skin of an adult weighs about six pounds. It is an organ of the body because it performs many essential functions. Perspiration, which is liquid waste, is given off through the skin. The skin also is a means by which the body can help to regulate its own temperature. Many of the organs for responding to touch, heat, and pain are located in the skin.

There are two basic parts to the skin. The surface is called the *epidermis*, *corneum*, or *cuticle*. This is the part that gets rubbed off when we skin a knuckle. Below this layer lies the *dermis*, or the *corium*. The word *dermis* is taken from the original Greek word for skin. The Greek word *epi*, meaning over, is added to the word *dermis* to

form the complete term *epidermis* for the outer skin.

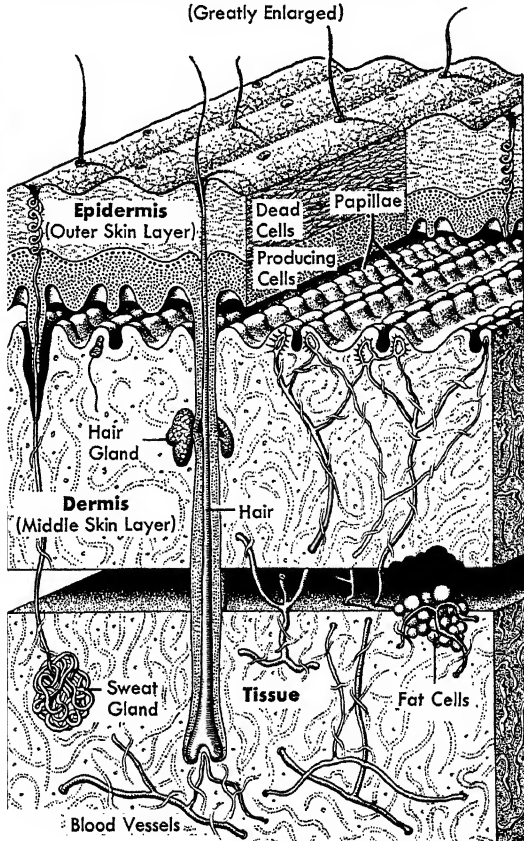
**Epidermis.** The top layer of the skin is made up of countless cells that are placed side by side like the paving stones in a street. There are twelve to fifteen of these rows, arranged one above the other. The cells of the skin grow from the bottom up. In the lowest row they are shaped like columns, or posts, and are perpendicular to the cells of the under skin. Above this lowest row of epidermis cells are several rows of round cells. These cells grow flatter and flatter toward the surface of the skin. They also become drier as they are pushed upward and outward by the new cells below them. When they finally reach the surface they are shed as thin flakes. These flakes are the dead skin a person often rubs off with a towel when taking a bath.

Some nerves are located in the lower cells of the epidermis, but there are no blood vessels in the epidermis. Any cut which draws blood must be deep enough to reach the dermis. The epidermis also is responsible for the color of the skin. Dark races have a great deal of pigment called *melanin* in the lower layers of their epidermis. The freckles which appear on the skins of the lighter races also are caused by melanin, and may result from exposure to the sun. The hair and nails are parts of the epidermis which have developed special functions.

The **Dermis** is made up of a closely woven network of

## CROSS SECTION OF HUMAN SKIN

(Greatly Enlarged)



connective tissue. It is from one sixteenth of an inch to one eighth of an inch thick. It is thickest on the back and thinnest on the eyelids. In the dermis there are blood vessels, vessels for carrying the lymph, nerve glands, and hair follicles.

On the outer surface of the dermis are a great many tiny elevations about one two-hundredths of an inch high. These are called *papillae*. Their name was taken from the Latin word for pimple. The papillae fit into tiny pits on the under surface of the epidermis, and help connect the two layers of the skin. The papillae contain the nerves that are sensitive to touch. They are especially well developed on the inside of the hands, where they are arranged in rows. The fine ridges on the balls of the fingers and the thumb show the pattern of the papillae. When a small group of papillae becomes overdeveloped, it sticks out above the surface of the epidermis, and forms a wart.

Wrinkles in the skin are caused when the fat and the other soft parts beneath the dermis are absorbed into the body and the skin itself does not shrink at the same rate.

**The Work of the Skin.** There are two kinds of glands in the skin. Some pour out sweat, others discharge oil. The sweat glands are tiny tubes that open up on the surface of the body. There are about two million sweat glands distributed over the surface of the body. They are most abundant on the palms of the hands, the soles of the feet, and the forehead. Sweat glands serve two functions. They give off the liquid waste matter of the body and they also regulate the heat of the body. As the sweat evaporates, it cools the surface. The oil glands, or *sebaceous glands*, generally open into the hair follicles. They give off an oily substance which makes the hair smooth and glossy, and keeps the skin from becoming too dry. Blackheads are formed when the tiny openings of the oil glands on the face become filled with dirt.

About one third of all the blood in the body circulates through the skin. This helps in regulating the heat of the body, because if the body wishes to give off much heat, the blood vessels in the skin can expand, and thus place more of the heat of the blood in closer contact with the outside air. On the other hand, when the body wishes to conserve its heat, the blood vessels in the skin tend to contract to keep the blood away from the colder outside air.

**Care of the Skin.** The most important care that can be given to the skin is to keep it clean. This keeps the tiny pores, or mouths of glands, in the skin from becoming clogged. It also hinders the spread of infection in the skin. Any kind of inflammation or infection in the skin is called *dermatitis*. There are many germs which can infect the skin. The skin also is subject to various rashes which may result from allergies. In some cases, such as in pellagra, the skin may show symptoms of vitamin deficiencies.

A.B.H.

**Related Subjects.** The reader is also referred to:

Freckles	Races of Man (color plate, Skin Color)
Nail	Scalp
Perspiration	Teeth
Pore	Tissue

## SKIN DISEASES AND INFECTIONS

Acne	Hives
Athlete's Foot	Impetigo
Birthmark	Lupus
Boil	Pellagra
Corn	Ringworm
Eczema	Shingles
Elephantiasis	Tumor
Erysipelas	Wart

**SKINK.** See LIZARD.

**SKINNER, CONSTANCE LINDSAY** (1879-1939), was an American novelist and historian. She is probably best known for her stories of life on the early American frontier. Her first book in this series for young people was *Silent Scott: Frontier Scout*.

She was born at a Hudson's Bay Company trading post in British Columbia, and spent her childhood among fur traders, Indians, and mounted police. At the age of sixteen, she became a writer for a British Columbian newspaper. Later she was a newspaper reporter in Los Angeles and Chicago. At the time of her death, she was editor of the *Rivers of America* series.

P.A.W.

**Her Works** include the novels *Ranch of the Golden Flowers* and *Red Man's Luck*; and the historical works *Adventures in Oregon* and *Pioneers of the Old Southwest*.

**SKINNER, CORNELIA OTIS** (1901- ), is an American actress and writer. She won great popularity for



Huston, Pix

**Cornelia Otis Skinner**, popular monologist and writer of humorous sketches

her clever interpretations in monologues which she wrote, such as *The Wives of Henry VIII*. In 1937 she produced, dramatized, and was the only character in a full-length "monodrama," *Edna His Wife*. She also wrote articles and verse for magazines as well as several books of light essays. With Emily Kimbrough she wrote *Our Hearts Were Young and Gay*. This was an amusing account of their trip to Europe as young girls.

Cornelia Otis Skinner was born in Chicago. Her father was Otis Skinner, the famous actor. She was educated at Bryn Mawr College and in Paris.

E.L.C.

**Her Roles** include starring parts in *Candida*; *Theatre*; and *The Searching Wind*. Her monologues include *The Empress Eugénie* and *Mansion on the Hudson*. Her books include *Dithers and Jitters* and *Soup behind the Ears*.

**SKINNER, OTIS** (1858-1942), was a prominent American actor whose polished performances were the result of thorough training and long experience. He was skillful in portraying both comic and sentimental characters. As a young man Skinner worked



**Otis Skinner**, long a star of the American stage



with Edwin Booth and Lawrence Barrett. He also was a member of Augustin Daly's company. He was born in Cambridge, Mass., and first appeared with the Walnut Street Theater Stock Company in Philadelphia in 1877.

B.M.

**His Roles** included leading parts in *Kismet*; *His Grace de Grammont*; *The Honor of the Family*; *Cock of the Walk*; *Mr. Antonio*; *Blood and Sand*; *Sancho Panza*; *A Hundred Years Old*; and *The Merchant of Venice*, in which he co-starred with Maude Adams.

**SKIPJACK** is another name for a click beetle. See **CLICK BEETLE**.

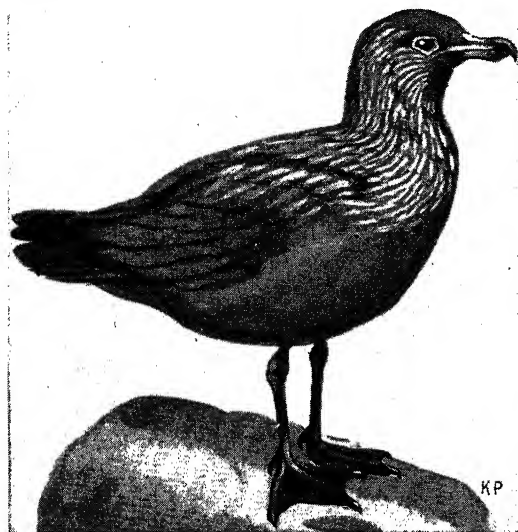
**SKIPPER**. See **BUTTERFLY** (Kinds of Butterflies); **INSECT** (color plates, Butterflies [Blue-striped Skipper; Long-dask Skipper]).

**SKITTLES**. See **BOWLING**.

**SKOPLJE**. See **YUGOSLAVIA** (Cities).

**SKRYABIN**. See **SCRIABIN**, **ALEXANDER**.

**SKUA**, *SKYOO* ah, is a bird of prey that lives for much of the year over the ocean. The skua is a fierce bird with a strong hooked beak and brown and white



**The Skua, or Sea Hawk**, is a robber bird found in Europe and North America. The skua is a solitary bird. It sometimes travels with a mate, but never appears in a flock.

feathers. Skuas are found far out over the sea, where they attack gulls and terns, taking the fish which these birds have caught. On land they also eat smaller birds and their eggs. They are related to the hunting gulls, or jaegers, but are larger. Skuas build their nests of sticks and grasses on the ground or on bare rocks. They lay from one to three olive-colored eggs, which are marked with brown or chocolate spots. Skuas do not conceal their nests, but fight savagely to protect them if the nests are discovered.

A.W.

**Classification**: The skua belongs to the family *Stercorariidae*. Its scientific name is *Catharacta skua*.

**SKULD**, *skeold*. See **NORNS**.

**SKULL**. The skull is the bony frame of the head of man and other animals with backbones. It is a case made up of bones that enclose and protect the brain, and those bones forming the face. The bones that en-

close the brain make up what is called the *cranium*. The cranium includes the top, back, and temples, or sides of the head. There are eight bones in the cranium known as the *cranial bones*. The cranial bones are the *occipital*, at the back of the skull, the *sphenoid*, at the base of the skull, two *parietal* bones, at the top and sides, two *temporal* bones, above the ears, the *frontal*, at the forehead, and the *ethmoid*, at the nose. The rest of the bones of the skull that form the face and support the jaw are called *facial bones*. There are fourteen facial bones.

A fall or blow over the head can sometimes fracture, or break the skull. In the case of a fracture the patient is usually unconscious. A doctor should immediately be called.

A.B.H.

See also **HEAD**.

**SKULL AND CROSSBONES**. See **SYMBOL**.

**SKUNK**. The skunk is a member of the weasel family. It is known for its powerful, unpleasant odor, which it uses to protect itself. Skunks live in North America but are close relatives of the European polecats. The skunk is a stockily built little animal, about the size of a large cat. It has a long, pointed nose, an arched back, and short legs. It walks like a person whose shoes are too tight. Skunk fur is long, thick and shiny, and is black with wide, white stripes down the back. The pattern of the stripes is different among various kinds of skunks. The skunk also has a white patch on its forehead. Its tail is long and bushy, black on top and white underneath.

The skunk's peculiar means of defense is provided by



Fish and Wildlife Service

**The Skunk is an Attractive Little Animal** that makes an excellent pet, despite the fact it can emit a very disagreeable when it is attacked or frightened by enemies.

a pair of glands near the tail. These glands contain a fluid which has a strong, sickening odor. When the skunk is frightened, it can squirt out the fluid with considerable force, and the vile odor usually keeps enemies at a safe distance. Any human being or animal which is sprayed with the evil smelling fluid must get used to smelling bad for a while, because the odor lingers for many days.

The skunk makes its home in a hollow tree, a burrow, or under a shed. It eats insects, mice, gophers, reptiles, squirrels, eggs, and poultry. The skunk makes its raids on the hen house at night, and often does much damage. But it is really more helpful to the farmer than harmful, because it kills other animals that prey on farm products.

The skunk is one of the most valuable fur-producing animals in North America. There are profitable skunk farms in Canada and the United States. Skunk fur is very beautiful. Garments of skunk fur were once sold under the names of "black marten" or "Alaska sable," but many are now sold under their real name. Buyers have learned that skunk fur wears better than many other furs, and have lost their distaste for the name and reputation of the animal. H.E.A.

See also FUR INDUSTRY; POLECAT.

**Classification.** Skunks belong to the family *Mustelidae*. The common skunk of North America is *Mephitis mephitis*. In Texas the hog-nosed skunk, *Conepatus*, is found. It has a white back. The small striped skunks of the Southwest are in the genus *Spilogale*.

**SKUNK CABBAGE** is a soft-stemmed plant which is found in low swamps in the eastern parts of North America. It is known for its heavy, unpleasant odor. Skunk cabbage is called a *perennial* because its roots send up new stems each year. The roots are heavy and coarse. The small flowers are collected in a thick spike which is surrounded by a brown leaflike organ called a *spathe*. The spathe gives off a very unpleasant odor. The leaves of the skunk cabbage are broad and one to three feet long. The leaves grow in groups called *tufts*, and are very attractive in appearance.

Occasionally, the skunk cabbage is planted in gardens because of the attractive appearance of the flowers and leaves. P.G.S.

See also ARUM.

**Classification.** The skunk cabbage belongs to the family *Araceae*. The species is *Symplocarpus foetidus*.

**SKY** is the name we give to the great blue arch of the heavens which we see above us. The lower portion of this space, immediately around our earth, is the region of wind, rain, and cloud. To astronomers, the sky is that part of space which we can see at any given moment as the earth is turning.

The word *sky* is generally thought to have come from the old Anglo-Saxon language. In ancient literature it is written *skæwes*, *skye*, *skiwes*, and *skie*.

In fair weather, the sky is a clear blue color. On other days the sky is dull or cloudy. At sunrise and sunset, the sky low over the horizon is often filled with beautiful red colors. These different colors of the sky are caused by the earth's *atmosphere*. This belt of gas around the earth is over 100 miles thick. It is made up of nitrogen, oxygen, hydrogen, neon, helium, and other

gases. When light passes through these gases, all the different rays are scattered. Some are scattered more than others. The shorter the wave length of the light, the more it is scattered. Blue is scattered the most, and red the least. Therefore the greatest part of the sky appears to be blue, as these scattered rays are reflected back to us from all parts of the sky. If there were no atmosphere around the earth, part of the light from the sun would hit us directly, and the rest would simply go past. The sky would always look black with the sun, moon, and stars shining in a great black curtain.

The fewer the particles of dust there are in the air, the more blue light is reflected to us, and the bluer the sky is on a "clear" day. When the sun goes down, its light passes through much more of the atmosphere than it does when it shines directly overhead. Most of the blue light is lost. Therefore we see more red light, and red and pinkish colors in the sky, reflected from the clouds most directly in front of the sun. When the sky is dull, in rainy weather, the light is hidden by the clouds of moisture.

Poetry and literature of all ages often speak of the sky. The expression "praise him to the skies," means to give someone great praise. The word *firmament* is sometimes used for the sky. There is an example of this in Psalm 19:1, where it is written that "The firmament sheweth His handiwork." O.J.L.

**SKYE ISLAND.** See **HEBRIDES**.

**SKYE TERRIER.** This bushy-faced dog is one of the oldest terrier breeds. It comes from the island of Skye, off Scotland, and is kept as a house pet. It is a good rat hunter. The skye is only eight or ten inches high, but its body is about twenty-two inches long. It has an outer coat of very long, silky hair. Its ears may be either erect or hanging. The dog may be sandy or spotted bluish gray to black in color, with a black muzzle. See also **DOG** (color plate, Terriers). S.E.M., Jr.

**SKYLARK.** See **LARK**.

**SKYLINE CAVERNS.** See **VIRGINIA** (Caverns and Springs).

**SKYLINES OF CITIES.** See illustrations in articles on **CHICAGO**, **DETROIT**, **LOS ANGELES**, **NEW YORK**, **SAN FRANCISCO**, **SEATTLE**.

**SKYROCKET.** See **ROCKET**.

**SKYSCRAPER** is a name for the relatively high buildings of American cities. Skyscrapers are possible because they have a steel skeleton supporting walls and floors.

Skyscrapers are typically American. They were first built in Chicago and New York City because of overcrowded conditions and the high cost of land. The only way to expand was toward the sky. The first experiment in skyscrapers was the Home Insurance Building in Chicago, which was built in 1884. Its skeleton was of cast iron and wrought iron. Today, steel has replaced iron in skyscraper construction because of its greater strength.

The best place to build a skyscraper is on land which lies shallow over bedrock. Heavy columns of concrete, called *caissons*, are laid on the bedrock. Where bedrock is too far below the surface, caissons are literally floated in mud or sand. Each caisson is the foundation for only one of the steel columns that make up the height of the building. As the columns rise, crossbeams of steel are

laid at each floor level. Then the thin outer wall is applied. The wall at each floor level rests on the steel crossbeams for that level. This distributes the weight of the building among all the crossbeams. The masons who are applying the walls do not have to build from the ground upward, but may start their work at any story. Before this kind of skeleton construction was designed, all of a building's weight rested squarely on its walls. Thus walls had to be extremely thick at the ground floor.

The first of the giant skyscrapers was the sixty-story Woolworth Building, completed in 1913 in New York City. Other giants in New York City are the Empire State Building, highest in the world (102 stories), the Chrysler Building (77 stories), the R.C.A. Building at Rockefeller Center (70 stories), and the Metropolitan Life Insurance Company Building (50 stories). Well-known skyscrapers in Chicago include the Civic Opera Building (45 stories), the Board of Trade Building (44 stories), the Tribune Tower (43 stories), the Pure Oil Building (40 stories), the Wrigley Building (30 stories), and the Daily News Building (25 stories). The Wrigley Building is one of the oldest skyscrapers in Chicago.

T.F.H.

See also BURNHAM, DANIEL H.; CHICAGO (illustrations); ELEVATOR; JENNEY, WILLIAM LE BARON; NEW YORK CITY (illustrations); SULLIVAN, LOUIS.

**SKYWRITING** is a method of writing in the sky with an airplane. Letters are traced with a trail of smoke which is produced by a special preparation mixed with the fuel of the plane.

The gigantic letters can be seen for miles. Skywriting is a common method of advertising products which have only a few letters in their name.

**SLAG** is the impure material which is removed in the process of making pig iron, and in smelting copper, lead, and other metals. The slag taken from steel blast furnaces is called *cinder*. It contains silicate of calcium, magnesium, and aluminum. The slag from copper and lead-smelting furnaces contains iron silicate, and sometimes other metals in small amounts. Slag from open-hearth steel furnaces contains lime and some iron. It is often broken up and smelted again.

**SLAM**, a card-playing term. See BRIDGE (Scoring).

**SLANDER**. A person who tells something likely to injure the reputation or good name of another person may be charged with *slander*. Writing or printing a similar statement is called *libel*. Authorities have not yet settled whether statements made over the radio are libel or slander. See also LIBEL.

F.S.S.

**SLANG** is a type of language in which meanings of words and phrases differ from the accepted standard. These meanings are novel, vivid, grotesque, expressive, and sometimes vulgar. Originally the term *slang* meant the speech of thieves, beggars, and tramps. They used special words to keep others from knowing what they meant. The outsider was not expected to know that "moll-buzzer," for example, meant one who steals from women.

Slang today has a wider use. Its words and expressions are outside the usual vocabulary. But they often become popular because they are appropriate and modern. There is no longer reason for most people to keep their meanings secret. All classes use slang. The uneducated perhaps use more of it. They do not have more dignified words at their command to express their meaning. Educated people often use slang terms on purpose, as a relief from the formal speech they use on other occasions. Some slang expressions have a way of putting fun or good humor into speech. Others help to keep conversation brisk and lively.

Slang should not be confused with idioms or with dialect peculiarities. It also

is different from technical language used by different professions, called *jargon*. Slang changes from time to time. Many expressions become outdated and new ones come into use constantly. Different age groups, professions, industries, and localities have their own slang expressions.

The slang term usually is not better than the word it replaces. But it is different and sometimes more expressive. Slang is short-lived. During its popularity a phrase may be overworked. But certain slang expressions are so vivid and useful that they find their way into dictionaries. Dictionaries usually label such words *slang* or *col-*



Gehr, Black Star

**A Fine Example of a Setback Skyscraper** in New York City. The lower walls rise straight up, distributing their weight on steel beams. The upper stories are graduated in a series of steps, following the idea used in Egyptian pyramids.

loquial. *Skyscraper*, *bootleg*, *bunk*, *gadget*, *vamp*, *jazz*, *hokum*, and *highbrow* began as slang. Other terms are so expressive and so full of meaning that they seem almost necessary in speech. Examples are *you said a mouthful*, *cold feet*, *apple sauce*, *wise crack*, *blurb*, *razz*, *ghost writer*, *hard-boiled*, *double cross*, *stuffed shirt*, *haywire*, *ritzy*, *scab*, *rubberneck wagon*, *easy mark*, *scram*, and *in the doghouse*.

**Sources of Slang** are many and varied. Most expressions come from the metaphor, a figure of speech in which one object is said to be another. News events, political and national problems, wars, and inventions give birth to much of our slang. Trades, amusements, and school and college life add their share.

From the circus we get such expressions as *spieler* for a side-show announcer. The theater uses *trying it on the dog* and *playing it in the sticks* to mean testing the reaction of a small-town audience to a new play. The amusement journal *Variety* once headed a story "Stix Nix Hix Pix." It meant that motion pictures which made fun of farmers as "hicks" were unpopular in rural areas. Aviation has contributed *bail out*, meaning to jump from the plane, *kevie bird* or *keewee*, meaning an aviator who does little flying but talks much about his ability, and *milk route* for a short airline or a feeder for a transcontinental line.

Large cities with their gangs and special crime problems have brought forth such terms as *racket* for a dishonest though profitable business, *pineapple* for the bomb used by gangsters because of its shape, and *take for a ride*, meaning to kidnap a rival gangster for the purpose of murdering him. Radio has been a fruitful source of slang. One who gossips is said to *broadcast*, disagreeable interference is *static*, to await developments is to *stand by*, and to depart or stop is to *sign off*.

University students refer to an invitation to a college affair as a *bid*; a sudden thought, especially one that is considered brilliant, as a *brainstorm*; and a free-for-all discussion among students as a *bull session*. World War II gave rise to many slang expressions. Typical are *snaftu*, meaning *situation normal*; *all fouled up*, applying to any confusion or trouble; *black out* for the enforced turning out of illumination of all kinds; *ack ack* for anti-aircraft fire; and *eggs* for bombs.

In a cheap restaurant, the waiter shouts for *Adam and Eve on a raft* when he wants fried eggs on toast. *Mrs. Murphy* is a potato, *Mrs. Murphy in a sealskin coat* is a baked potato, and *sinkers and java* means doughnuts and coffee.

Many popular slang phrases can be traced to very old sources. *Fresh*, *dumb*, and *flaming youth* originated during the time of Queen Elizabeth. Sometimes such slang is dropped for a while and later brought out again as new slang.

**Slang Is Spread** by newspapers, comic strips, and political campaigns and speeches. Motion pictures, novels, periodicals, plays, and musical comedies have brought much of it to the public. Slang often shows the date of its use, just as a style in dress tells its season. Examples of out-of-date or vanishing slang are *cat's pajamas*; *swelelegant*; *do re mi* (for money); *twenty-three skiddoo*; *I love my wife but oh, you kid*; and *Tell it to Sweeney*.

Many people think that slang is most popular in the United States. But the language of every country has

similar picturesque expressions. Slang dictionaries have been compiled in almost every major language.

**Dangers of Slang** are few in number but important. The use of slang may narrow a person's vocabulary. It also may do away with fine shades of meaning. Many expressions are so overworked that hearers are tired of the mere sound of them. And many expressions are used where they do not apply. The first time anyone said, "That hat's a perfect wow," the figure was forceful. It perhaps expressed the idea better than any other expression could have done. But the force is lost when "a perfect wow" is used to describe everything from a salad to a Beethoven sonata. The use of too much slang leads to the omission of many words and phrases which are more accurate and often more interesting.

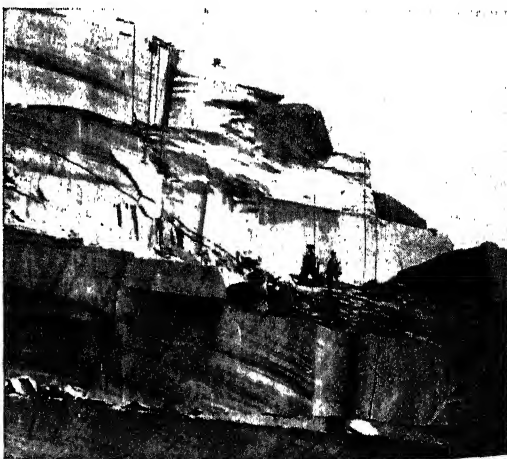
C.Sr.

See also DIALECT; IDIOM; JARGON.

**SLATE** is a rock which can be split into thin smooth layers. It is made up of tiny grains of mineral. These grains are very closely packed together and are arranged in layers. Slate is a *metamorphic* rock. A metamorphic rock is one that has been produced from another kind of rock through the action of heat, pressure, or gases. Slate is produced from clay and shale which have been compressed in nature. When a great deal of pressure is applied to beds of clay and shale, their tiny grains are rearranged into very thin layers which can be split into sheets as thin as paper. These layers of rock are slate, and the way in which the rock splits is known as *slaty cleavage*. See METAMORPHISM.

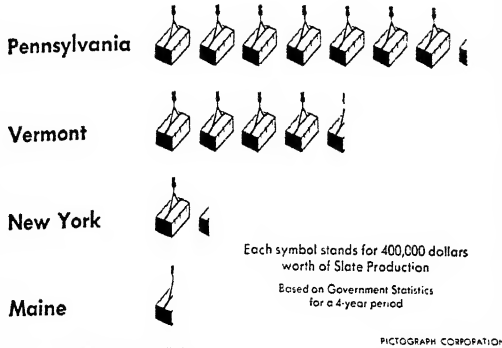
Slate is very useful to man. It is quite soft and can easily be trimmed into any desired shape with hammer or saw. Despite its softness, it is quite tough and is not affected by bad weather. That is why it is much used in roofing. Slate is usually light to dark gray, but it also is found in brown, red, and green. Sometimes several colors are used in roofing to make an attractive design. Slate also is used in the manufacture of certain sanitary and electrical appliances.

The largest quarries of slate in the United States are in Pennsylvania, Vermont, New York, Maine, and Virginia. Slate also is quarried in great quantities in



**Workers in a Slate Quarry** remove the rock in layers from its natural bed and transport it to market.

### Four Leading Slate States



Europe. Wales is the most important slate producing center.

W.H.Bu.

See also BUILDING STONE.

**SLATER, SLAY ter, SAMUEL** (1768-1835), was an industrialist who founded the American cotton industry. He was born at Belper, in Derbyshire, England, the son of a farmer. Slater attended grammar school and at the age of fourteen was apprenticed to the partner of Richard Arkwright, an inventor of cotton manufacturing machinery. After Slater learned the trade, he decided to go to America, where there was great opportunity for men experienced in textile production. England wanted to keep the textile industry entirely for itself, and it was against the law for textile workers to leave the country. But Slater got away without being discovered. In America he made an agreement with the firm of Almy and Brown to produce Arkwright's machines. In 1793 they established a factory at Pawtucket, R.I. Slater set up other cotton mills throughout New England. H.U.F.

**SLATER FUND** is an endowment of \$1,000,000, made by John Fox Slater in 1882. The fund was set up to give the newly freed Negroes a "Christian education." It has been used mainly for the support of Negro schools, and pays salaries, training, and operating and building expenses. It is now handled as part of the Southern Education Foundation. See also SOUTHERN EDUCATION FOUNDATION. C.A.

**SLAV, slahv, or slav.** The Slavs, or Slavonians, are a group of people who live in Eastern Europe and Siberia. There are about 200,000,000 Slavs. These include Russians, Poles, Wends, Ruthenians, Czechs, Slovaks, Croats, Serbians, Bulgarians, and Montenegrins.

The original Slav people were probably a division of the old Aryan-speaking or Indo-European peoples. The early Slavs lived in regions of northwestern Ukraine and southeastern Poland. Most of them were farmers and herdsman. Between A.D. 200 and 500, the Slavs began to migrate to other parts of Europe. They went into regions of Germany, Montenegro, Albania, and Russia.

The early Slavs were a Nordic type of people. They were tall and had long heads and fair skin. But mixture with other peoples through hundreds of years has almost eliminated the early Slav type. For example, Slavs who live in Mediterranean areas are much darker than the fair-skinned Slavs of White Russia. Some Slavs may

have straight blond hair but others may have wavy brown hair. Ruthenians have dark, narrow faces, while Poles are roundheaded and light-skinned.

All Slavs except the Russians have suffered long years of oppression by other countries. They have never shown the same spirit of organization as their German neighbors. But the Slavs are brave and adventurous, and have made splendid soldiers and daring pirates. They are lovers of fine music and poetry. Throughout history the Slavs have remained individualists.

**Panslavism.** About 1830 a Slav movement began to arise throughout Europe. The movement was led by Russia and was known as *Panslavism*. The scattered Slavic people of Europe began to awaken to the hope of national independence. Panslav congresses were held in Praha (Prague), Moscow, and Vienna. Inspired by the thought of unity, the oppressed Slavs grew restless and dissatisfied. They began to demand freedom from foreign control, and discontent reached a boiling point throughout the Balkans. But the movement met with failure because Slav national groups could not co-operate with each other.

**Culture and Art.** Slavs have contributed much to the world in education and art. The Bohemia University of Praha, founded in 1348, was for many years one of the finest schools in Europe. The University of Kraków was the school of the great Polish astronomer, Nicolaus Copernicus. Many outstanding artists and musicians have come from Bohemia. Polish music is world famous, and Russian music has all the great sentiment of the Slavic soul.

**History.** Every Slav nation has had its national tragedy. Even Russia was invaded by the savage tribes of Genghis Khan. Serbia lost its power after the Battle of Kosovo, and the Czechs suffered cruel defeat at the Battle on White Mountains. Polish territory was divided among its enemies three different times. Still the Slavs have carried on their struggle for freedom.

After World War I, the Republic of Czechoslovakia was created for the Czech and Slovak people. But Hitler destroyed the country in 1939. Yugoslavia became the country of the southern Slavs, but it, too, was invaded by the Axis forces. The Slavs of the Ukraine became an independent state in the Union of Soviet Socialist Republics. The Soviets freed both Czechoslovakia and Yugoslavia from Nazi domination during World War II, but exercised their own domination to at least an equal degree.

W.M.Kr.

See also SLOVAK.

**SLAVE LAKE, GREAT.** See GREAT SLAVE LAKE.

**SLAVE RIVER, or GREAT SLAVE RIVER.** This waterway is an important link in the great Mackenzie River system of Canada. The Slave River is about 300 miles long. It flows out of Athabaska Lake in the province of Alberta and winds in a northerly direction across the Northwest Territories to empty into Great Slave Lake. The Mackenzie River flows out of the western end of Great Slave Lake. Just as the Slave leaves Athabaska Lake, it gets the waters of the Peace River, which also is a part of the Mackenzie system. Steamers can sail over all but about thirteen miles of the course of the Slave in summer. The river is frozen over during most of the winter.

L.D.,Jr.



**SLAVERY** was actually a forward step in the march toward civilization. For many hundreds of years, conquerors simply killed their enemies. The idea of using captive men and women to do the rough work of a community instead of killing them was therefore a humane reform. Besides, the masters gained some leisure time. Most of them used the time in idleness, but some used it for useful thinking and planning. See **CIVILIZATION**.

The enslaving of captives gradually came to an end. It was replaced by two other types of slavery: the enslavement of debtors and the enslavement of Negroes. During World War II, Nazi Germany followed the old practice of making slaves of conquered peoples.

**Slavery in the Ancient World.** Most ancient peoples had slaves. Among the Hebrews, the laws of Moses provided that a slave of their own race should be set free after six years, and foreign slaves should be liberated twice in each hundred years. Among the ancient Greeks, slaves were often purchased from pirates, and poor men sometimes sold their children into slavery. Debtors were sometimes sold into slavery to satisfy their debts, but Plato and his followers thought that one Greek should never make a slave of another. Greek slaves could hold positions of some responsibility and could sometimes buy their freedom.

In Rome, slavery flourished as long as the armies continued their conquests. Wealthy men kept large numbers of slaves. Some authorities believe that at the height of the Roman Empire there were three slaves to every free man. Roman slaves were often set free, and sometimes rose to high positions.

**Revival of Slavery.** Slavery in Europe slowly changed into serfdom, and bondsmen took the place of slaves. (See **SERF**.) By the 1300's, slavery had almost disappeared. But during the 1400's Portuguese explorers in Africa allowed several captured Moors to free themselves by giving the conquerors black slaves. Soon the Portuguese began capturing African Negroes and bringing them into Europe as slaves. In 1516 King Charles V of Spain gave colonists and slave traders permission to take slaves into the Spanish colonies of the New World.

The slave trade became so profitable that several nations took part in it. By the time of the American Revolution, the British were carrying about half the slaves that were brought to the Western world.

In 1792 Denmark became the first nation to put a stop to the slave trade. But the fight against slavery had begun earlier. In England the Quakers started an anti-slavery movement in 1671. American Quakers took up the fight in 1696. Rhode Island, in 1652, passed a law providing that no man should be held in service for more than ten years, and that no man should be sold.

Thomas Clarkson and William Wilberforce persuaded the British House of Commons to pass a bill against the slave trade in 1792. Slavery was abolished in all British colonies in 1833.

In January, 1808, the United States prohibited further importation of slaves. This act legally ended the overseas trade in slaves, but slavery itself continued until after the War between the States.

Most of the republics of Latin America abolished slavery as soon as they had won independence. But Brazil did not give up slavery until 1871. W.D.H.

**Related Subjects.** The reader is also referred to:

Abolitionist	Emancipation Proclamation
Alabama (History	Free Soil Party
[Early Statehood])	Fugitive Slave Law
Ancient Civilization	Greece (History and
(Power)	Government)
Arago, Dominique	Hawkins, John, Sir
François	Helot
Buchanan, James	Jubilee
(Administration as	Kansas-Nebraska Bill
President)	Lincoln, Abraham
Chase, Salmon P.	Mason and Dixon's Line
Colonial Life in	Missouri Compromise
America (Slaves;	Reconstruction
Plantation Life)	Squatter Sovereignty
Compromise of 1850	Underground Railroad
Confederate States of	United States (History)
America	War between the States
Crittenden Compromise	Wilberforce, William
Dred Scott Decision	Wilmot Proviso

#### FAMOUS SLAVES

Aesop (see <b>AESOP'S FABLES</b> )	Truth, Sojourner
Epictetus	Tubman, Harriet
Terence	Wheatley, Phillis
Toussaint L'Ouverture,	
Pierre Dominique	

**SLAVONIA**, *slah VO nih ah*. See **CROATIA AND SLAVONIA**.

**SLED.** Primitive men made crude sleds from logs which they tied together and dragged along the ground. Later, men found that sleds could be drawn or pulled easily and swiftly over snow and ice if the sled were placed on slats of wood, or runners. After the wheel was invented, sleds became less important as a means of travel. They are still widely used in regions of much snow and ice, such as the Soviet Union, Lapland, Iceland, Alaska, and the Yukon.

The North American Indians used a toboggan sled, which was shaped somewhat like a canoe on runners. The Pilgrims made their sleds of a box set on a pair of runners. Their sleds usually were drawn by oxen.

In the countries of the Far North, where snow and ice cover the ground for many months of the year, sleds are the chief means of transporting people and goods. Sleds pulled by a team of huskies or Eskimo dogs are the chief means of travel in parts of Alaska and the Yukon. Alaskan sleds are built to stand the roughest travel. The most common Alaskan sled is the Nome sledge, a long, narrow type with basket sides. A good team of dogs, hitched to a Nome sledge, can haul one thousand pounds of cargo. The Nansen sled is wider and lightly made of wood and rawhide lashings. A thirty-pound Nansen sled can carry a 600-pound load. Sleighs called *troikas* are used in the Soviet Union. They are drawn by horses or reindeer. In Lapland, reindeer are harnessed to open sledges used for carrying heavy goods.

Sleighs gaily decorated with bells and colored tassels are popular in all northern countries, and sleighing is a favorite winter sport.

The coasting sled came into use after 1870 in the United States. The original coasting sled was the "clipper" type which was built low, with long, pointed sides, and runners of round steel rods. The "girl's sled" was a light, short box, with high, cut-out or skeleton sides, and wide, flat runners. The double-runner or bobsled was formed of two clipper sleds joined end to end by a board



H. Armstrong Roberts

**The Coaster Sled** has steel runners and a wooden frame. This boy is holding the sled at his side while he runs to do a "bellyflop." After a short run, he will lower the sled to the ground and lie down on top of it to coast.

and steered by ropes, a wheel, or a crossbar. Four to ten persons rode in the bobsled.

Coasting sleds today are made on the same lines as the clipper sled. Since coasting on highways is dangerous, sledding and bobsledding are sports best enjoyed on hills and in the open country.

F.M.R.

See also TOBOGGANING; TRANSPORTATION (illustration, Conveyances without Wheels); TROIKA.

**SLEDGE.** See SLED; TRANSPORTATION (illustration, Conveyances without Wheels).

**SLEEP** is one of the most essential activities of living things. If a human being goes without sleep for more than twenty-four hours, he can not act normally. His ability to remember also becomes very poor. Even mild-mannered persons become very irritable if they have lost much sleep. If a person goes without sleep for three days or more, he may start "seeing things" and show other abnormal mental symptoms. But with the aid of such drugs as benzedrine sulfate, scientists have kept themselves awake for as long as 180 hours. Sleep also is important for animals. Scientists kill animals in a laboratory merely by not allowing them to sleep.

Many scientists have tested the effects of partial lack of sleep upon our mental abilities. In some cases, they found that sleeping two hours less than usual a night improved mental abilities. Much greater loss of sleep caused some loss in mental abilities.

Scientific research has led to the opinion that there is no "normal" period of sleep for any individual. The individual himself has to discover how much sleep he needs for his personal efficiency. Newborn babies sleep most of the time, and wake only to eat. They may sleep twenty-two out of twenty-four hours. All doctors agree that growing children need more rest and more sleep than adults do. Some adults are reported to have slept as little as four hours a day, but usually they were able to take quick naps during the course of the day and thus add to their total amount of sleep.

There are two major different sleeping patterns among people. Some persons have a high body temperature and high efficiency rate in the morning. Others have their highest temperature and efficiency in the late afternoon or evening. The persons who have a high morning temperature generally prefer to go to bed early at night and get up early in the morning. Those having a high evening temperature generally prefer to work late and sleep late in the morning. They usually wake up tired. Nearly everyone moves about in his sleep during the night.

Most people do not fall asleep immediately when they go to bed. Some surveys have shown that this period of lying awake may average as much as twenty-three minutes. Some people, however, find much greater difficulty in going to sleep than others. This condition of sleeplessness is called *insomnia*. There is no definite cure for insomnia. Some individuals take sleeping pills, which often contain one of the drugs called *barbiturates*. Sleeping pills are usually very habit-forming. Doctors advise against using them continually, although on some occasions a sleeping pill may be valuable. The chief causes of insomnia are usually mental, and are best treated by mental and emotional adjustment of the victim of the disease.

Proper sleep usually depends upon the development of proper habits early in life. If the individual goes to bed in a darkened room free from distractions, sleep usually comes much easier than when the lights are on and disturbances are going on about him.

One form of abnormal condition accompanying sleep is called sleepwalking or *somnambulism*. The sleepwalker gets out of bed and performs various activities in his sleep. Sleepwalking seems to be partly hereditary in nature, and has never been thoroughly explained.

In a disease called *narcolepsy* an individual finds himself unable to stay awake. He falls asleep many times during the course of a day. Such an abnormal sleep may last from a few seconds to several hours.

A.C.I.

**Related Subjects.** The reader is also referred to:

Dream	Sleeping Sickness
Hibernation	Sleepwalking
Insomnia	Snoring
Nightmare	

**SLEEPING BAG.** See CAMPING (What to Take on a Camping Trip).

**SLEEPING CAR.** See PULLMAN, GEORGE MORTIMER.

**SLEEPING SICKNESS** is a common name for diseases which put the patient in a deep, sleeplike condition. These diseases attack both men and horses.

**African Sleeping Sickness** is technically known as *trypanosomiasis*. It is caused by a species of animal

parasites. The disease is found chiefly in Africa, where it is transmitted to man through the bite of the tsetse fly. The first symptoms are an uneven fever, headache, weakness, and an inability to sleep. Then the glands become enlarged, and a red eruption appears on the skin. As the disease progresses, the victim grows weaker and the desire for sleep comes over him. This desire grows until he can be awakened only with difficulty. The hands and tongue tremble, and toward the last there are convulsions.

The African sleeping sickness is nearly always fatal to white men, unless it is checked in its early stages. In some parts of Africa, the disease is usually fatal to the native, too. But natives in other places seem to have developed an immunity to the disease, and a large percentage of them recover. The so-called "Rhodesian" type of sleeping sickness is the most acute. It kills more quickly, and is more resistant to drugs than the other forms.

Sleeping sickness is treated by arsenic compounds, antimony compounds, and by a secretly composed drug developed in Germany which is called *Bayer 205*. This drug is especially helpful in treating white men infected with the Rhodesian type. French chemists of the Pasteur Institute have produced a drug believed to be the same as *Bayer 205*. It is called simply *309*. An arsenical compound called *tryparasme*, which is prescribed for locomotor ataxia, also is used to treat sleeping sickness. All these drugs must be used with care because of their powerful effects.

The prevention and control of sleeping sickness are being studied by an international commission. The methods generally approved include isolating the infected persons, systematic blood examinations of persons in an infected area, and the avoidance of regions known to be infested with the tsetse fly. Exterminating the flies by means of chemicals also helps control the disease.

**Encephalitis Lethargica** is the second form of sleeping sickness. Its technical name means *inflammation of the brain with resulting lethargy*. It is caused by a filtrable virus and has occurred in many different parts of the world since 1915. The first symptoms are slight fever, stupor, drowsiness, and paralysis of some part of the face. Although this disease is called sleeping sickness, many cases are just the opposite and the patient is excited and sleepless, rather than stupefied.

Few people seem susceptible to this disease, and usually only one case develops in a household. Those deaths which have been reported vary from 20 to 50 per cent of the cases.

The disease was first heard of during the world-wide influenza epidemic which killed so many people in 1918. Physicians have failed to find any proof that these two ailments are caused by the same organism. Careful nursing, making the patient comfortable, and strict

attention to hygiene are the chief points in the treatment. Mild cases may recover in a few days, but severe attacks may persist for weeks. *Parkinson's disease*, or *paralysis agitans*, is one of the most frequent after-effects. Another one is a change in personality, showing irresponsible behavior and mental changes merging into insanity.

**Sleeping Sickness of Horses** is the name commonly given to *equine encephalomyelitis*, or *Borna disease*. It is said to be transmitted by mosquitoes.

**SLEEPLESSNESS, or INSOMNIA.** See INSOMNIA.

**SLEEPWALKING, or SOMNAMBULISM,** is a condition in which a person carries out physical actions while he is asleep. Almost everybody dreams during sleep, and many people talk in their dreams. But few persons act out their dreams in physical motion. Some sleepwalkers simply get out of bed and walk around. Other somnambulists perform many more difficult acts.

Tests have shown that most sleepwalkers can not hear ordinary sounds. The somnambulist can not see, taste, or smell. But he generally has excellent control over his muscles. Many sleepwalkers have performed acts which they could not do if they were conscious. Upon awakening, sleepwalkers may remember what they have done, but they remember it only as a dream.

Psychologists describe somnambulism as an extreme form of absent-mindedness. Something in the subconscious mind forces the sleepwalker to follow only one line of action. Many psychologists believe that sleepwalkers have really hypnotized themselves.

Sleepwalkers are usually very nervous persons. Sleepwalking is fairly common in childhood, but tends to disappear as children grow older. Many cases of somnambulism are helped by good health care and by avoiding strain and excitement.

See also HYPNOTISM (Hypnotism from Shock).

**SLEET** is frozen or partly frozen rain. It is formed when raindrops enter a layer of intensely cold air. When the frozen raindrops come in contact with objects, even specks of dust, they freeze into white, round ice pellets. When the cold rain touches large objects, such as twigs or branches, telephone wires, rooftops, and roads or sidewalks, these objects become coated with ice. This ice coating, known as an ice storm, reveals a landscape of great, glistening beauty when the sun appears. If the ice coating is heavy, the result can be very destructive. Cars skid on roads, people find it difficult to walk without slipping, telephone and telegraph wires become useless, and railroad and air-line transportation is sometimes interrupted.

Sleet always occurs in very cold weather. It is usually mixed with snow or rain, but it is not a small form of hail, as many persons believe. Hail melts shortly after it falls. See also HAIL.

**SLEIGH.** See SLED.

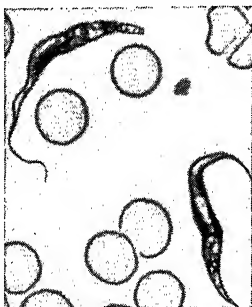
**SLEIGHT-OF-HAND, *slite-of-hand*.** See CONJURING.

**SLICK, SAM.** See HALIBURTON, THOMAS CHANDLER.

**SLIDE.** See BACTERIOLOGY.

**SLIDELL, JOHN.** See MASON, JAMES MURRAY AND SLIDELL, JOHN.

**SLIDE RULE** is a device in the form of a ruler. It is used for rapid numerical calculations involving mainly multiplication and division. Basically, a slide rule is an



**Sleeping Sickness** is caused by long wormlike trypanosomes.

addition or subtraction device. For example, arrange two identical equally divided rulers with the zero of the lower scale below, say, 4 of the upper (as in Figure 1). The numbers on the upper scale are 4 larger than those

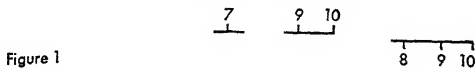


Figure 1

on the lower. These scales can then be made to add or subtract numbers by sliding the lower scale to different positions.

To use rulers for multiplying numbers, we use logarithmic scales (see *LOGARITHM*). We mark off the logarithms of numbers and label the marks with the num-

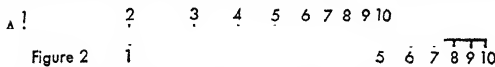


Figure 2

bers. Figure 2 shows two such scales. We have placed the mark 1 on the lower or B scale under the mark 2 of the upper or A scale. Then every number on the A scale is twice the number on the B scale immediately below it. If we had put 1 on the B scale under 3 on the A scale, the multiplier would have been 3. Also in the figure, every number of the A scale divided by the number below it on the B scale gives 2, which illustrates how these scales are used for division. This figure is a primitive slide rule. In its perfected form, a slide rule consists of a ruler with a sliding middle section. Both ruler and the slide have similar logarithmic scales printed on their corresponding edges. A runner or indicator made of transparent material, with a vertical line down the middle, is used to fix coinciding points on the scales. The slide rule in common use solves problems involving

multiplying, dividing, squaring, cubing, and extracting square and cube root. Some slide rules have additional scales for more complicated operations.

T.H.H.

**SLIME MOLD** is a tiny plant of very simple structure. It is usually found on decaying wood and on soil which contains a large amount of humus. Some slime molds live as parasites on cultivated plants. Clubroot of cabbage and powdery scab of potato are caused by slime molds.

Slime molds have been classed as both animals and plants. In some respects they do resemble tiny animals. The spores germinate in moist soils or on decaying wood, forming a simple cell with a single, slender hairlike attachment. With this attachment, the organism swims about. Later it loses the attachment, called the *flagellum*, and several cells unite in a jellylike mass which has the power of slow, creeping movement. This mass, called the *plasmodium*, is the vegetable body of slime molds. Finally the plasmodium develops into masses of moldlike spores which have many forms. The masses are often found on stumps and bark, varying in color from white to orange and red. The largest may be several inches square, but others are much smaller.

W.F.H.

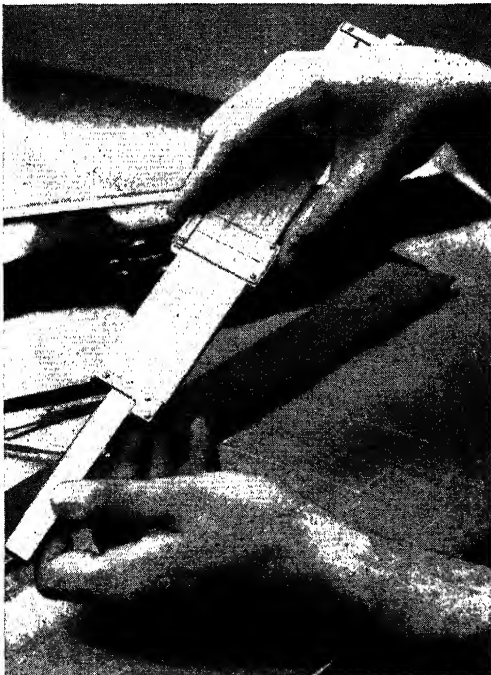
**Classification.** The slime molds belong to a class of plants known as *Myxomycetes*.

**SLING.** The sling is one of the most ancient weapons. It was probably the first weapon designed to hurl a stone with more force than a man could deliver with his hand and arm. In its simplest and oldest form, the sling is a leather or hide strap, with a string fastened to each end. The stone or other object to be thrown is placed on the strap, and the operator holds the two cords in his hand. He whirls the sling rapidly above his head to get speed, and then lets go of one end of the cord. The stone is hurled with the same speed at which the sling is being whirled.

Slings are mentioned many times in the Bible. The most familiar reference is to the slaying of Goliath by David with a stone (I Samuel 17:49). It also is recorded that 700 left-handed slingers of the Benjamites "could sling stones at an hair breadth and not miss" (Judges 20:16.)

The ancient people of the Balearic Islands were famed for their skill with the sling. The sling was of great use to the armies of Egypt, Greece, and Rome. During the Middle Ages, slings attached to a staff were used to hurl big stones against fortifications and castles. This sling was hurled with both hands, and the size of the stone was limited only by the strength and skill of the thrower. In the ordinary one-hand sling, the stone was "the size of a man's fist."

**Slingshot.** In America a small hand catapult is called a *slingshot*, or *sling*. It is made by fastening an elastic band on each prong of a forked stick, and connecting the elastics by a leather pouch in which a stone or small metal bullet is placed. The fork is held in one hand, and the elastic is stretched with the other hand. The thumb and first finger hold the stone or bullet in place. The shot is hurled with great force when the elastic is released. Partridges, small birds, rabbits, and squirrels can be killed with such a slingshot. Such slings also can cause serious injury to a human being. The use of slingshots is forbidden in most cities.



H. Armstrong Roberts

The Slide Rule makes it possible for the draftsman to make mathematical calculations easily and rapidly.

**Bolas** are weapons used by the North American Indians, and on the pampas of many South American countries. Bolas are made of stone or balls of clay, securely fastened to the ends of lengths of rope or cowhide. There are usually three of these ropes. The free ends are tied or braided together and used as a handle. The thrower, often on horseback, whirls the weapon over his head, takes aim, and hurls it at a running ani-

### SOME TYPES OF SLINGS



Roman Sling



Modern Slingshot



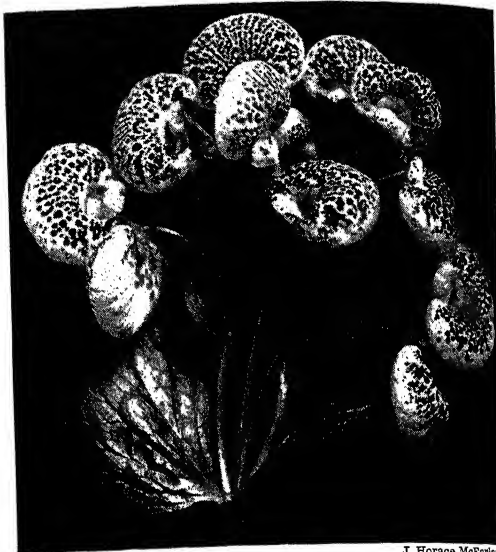
South American Bola

mal. If he is successful, the stones or balls wind the ropes around the animal's legs and throw it to the ground. There are several kinds of bolas. One type has only one rope about six feet long, with a weight attached to each end.

R.COL.

**SLIP KNOT.** See KNOTS, HITCHES, AND SPLICES.

**SLIPPERWORT** is the name of several evergreen plants whose blossoms are shaped somewhat like slippers. They are native to tropical America, mostly in the Andes of South America, but several are grown in hothouses and gardens in temperate parts of North America. Slipperworts have many showy flowers. Two of the most popular are the *common slipperwort*, with spotted yellow flowers, and the *bush slipperwort*, which has small yellow flowers. A third species, having violet flowers, also is popular.



J. Horace McFarland

The **South American Slipperwort** gets its name from its spotted blossom which looks like a slipper or pouch.

The other species range in color from creamy white to maroon or crimson. The plant may be either an herb or a shrub.

P.C.S.

**Classification.** Slipperworts make up the genus *Calceolaria* of the family *Scrophulariaceae*. The common is *C. crenatiflora*, the bush is *C. integrifolia*, and the violet-flowered is *C. purpurea*. When cultivated in hothouses, they usually are known by their Latin name, *Calceolaria*.

**SLIPPERY ELM.** See ELM.

**SLIVER.** See COTTON (MANUFACTURING); SPINNING.

**SLOAN, ALFRED P., FOUNDATION** is a fund which was set up in 1936 by Alfred P. Sloan, Jr., (1875- ), an American automobile manufacturer and financier. The Foundation makes grants of money to universities and other institutions for specific projects in the field of economic education. It has made such grants to the University of Chicago for its Round Table program, to New York University for its Film Library and Institute of Postwar Reconstruction, and to the Public Affairs Committee of New York for a pamphlet series. The Foundation has assets of \$6,136,804 and has made grants of nearly \$3,000,000.

C.A.

**SLOANE, HANS, SIR** (1660-1753), was a British doctor and collector. His private museum provided the beginning of the British Museum. See BRITISH MUSEUM.

Sloane was born at Killyleagh in County Down, Ireland, of Scottish parents. He studied medicine in London and later in Paris. From the time he was a boy he delighted in making collections, especially of natural history specimens. Sloane was the first British scientist to visit the island of Jamaica, and brought back specimens of some 800 plants from there. By the time of his death, his collection included coins, medals, antiquities, natural history specimens, and a library of 50,000 volumes. He gave all of it to the British Government.

**SLOBODKIN, sloh BOD kin, LOUIS** (1903- ), is an American sculptor and illustrator of children's books. His illustrations for *Many Moons* won the Caldecott



Medal for 1943. Slobodkin was born in Albany, N.Y. He studied sculpture at the Beaux Arts Institute of Design in New York and in Paris. He won more than twenty medals for his works. His sculpture decorates many public buildings. One of the best known of his pieces is his eight-foot bronze statue of "Young Abe Lincoln" which stands in the Department of the Interior building in Washington. He wrote and illustrated *The Friendly Animals*, *Magic Michael*, and *Clear the Track!* See also CALDECOTT MEDAL. H.B.O.

**SLOE**, *sloh*, is the name of a spiny branching shrub related to the plum. It grows in Europe, Central Asia, and the mountains of southern and eastern North America. It has pure-white blossoms which appear before the leaves do. Small black fruits about the size of a pea develop from the flowers. These fruits are used for making wine, jelly, preserves, and dyes. Canes and tool handles are made from the hardy branches of the shrub. It also is called blackthorn. J.J.L.

**Classification.** The sloe belongs to the rose family, *Rosaceae*. Its botanical name is *Prunus spinosa*.

**SLOGAN.** A slogan is a word or phrase designed to persuade people to take some action. "Remember Pearl Harbor" and "Buy War Bonds" were patriotic slogans in the United States during World War II. "See America First" has been a slogan used in advertising by the travel industry for many years. Slogans may be for promotional or propaganda purposes, such as "Safety First," or "100 Per Cent American." Trademarks may be obtained for slogans used in advertising. See also TRADE MARK.

**SLOOP.** See YACHTING.

**SLOTH**, *sloth*, or *slawth*, is the common name of a family of South American animals which have a very slow and peculiar way of moving about. They walk upside down, hanging from branches. Sloths can hang so securely from the branches with their hooklike claws that they even fall asleep in this position. Once the muscles have become fixed, or tensed, in a certain way, they can not relax until the animal awakens and relaxes them deliberately.

These queer animals are very odd in appearance. They have almost no tails or ears, and their noses are blunt. They have well-developed peglike teeth. Their hair is long and coarse. In some species it is grayish in color, which makes them hard to see among the branches. A sloth asleep looks very much like the stump of a bough, especially when it has a growth of green algae on the hair, as many sloths do.

Sloths seldom come down to the ground. They do not need to, for they feed on leaves, buds, and young twigs of the trees. They sleep by day and always move with great caution, for they are the prey of many stronger animals, such as jungle cats.

People use the expression "slothful" to describe lazy people. Scientists say that the sloth's sluggishness is, at least partly, caused by its extremely low body temperature. It moves about one third of a mile an hour, when it moves at all. Scientists have discovered that the sloth's speed increases 50 per cent when its temperature is raised five or six degrees. Sometimes the sloth moves rapidly when it is in danger.

There are two main species. One, called the *Unau*,

has two toes on the front feet. The other, called the *Ai*, has three toes on the front feet. R.T.H.A.

See also ANIMAL (Plants and Animals; color plate, Central and South America).

**Classification.** Sloths make up the family *Bradypodidae*. The two toed sloth is in the genus *Choloepus*. The three toed is in the genus *Bradypus*.

**SLOTH BEAR.** See ANIMAL (color plate, India, South Asia, and East Indies); BEAR (Kinds of Bears [Other Bears]).

**SLOT MACHINE** is a device which works when a coin is dropped into a special slot. The coin sets the mechanism in motion. The earliest known slot machine was used to sell holy water in Egyptian temples about 2,000 years ago. Different types of slot machines are used for amusement, music, vending (selling), and gambling. All are known as coin-operated devices in the slot-machine business.

The most common type of slot machine is the vending machine. It is used to sell peanuts, gum, cigarettes, fruits, ice cream, candy, postage stamps, beverages, and other small articles. Since 1916 some restaurants, called *automats*, have used slot machines to serve food. Coin-operated meters sell measured amounts of gas or electricity. The coin-operated public telephone is a type of slot machine. The coin-operated parking meter solves one automobile problem and also provides income for the city.

A group of amusement slot machines collected in one place of business is called a *penny arcade*. The most popular device is the *pinball game*. Another, the electric ray target gun, was copied by the government and used to train troops during World War II. Arcades still have a form of the Edison kinoscope, father of the motion picture. A coin starts a progressive series of picture



Press Association

**This Slot Machine Issues Railroad Tickets.** The buyer pushes the button of the desired station, then drops coins into the slot. The machine returns ticket, and makes change.

cards flipping over, which seems to make the picture move. The most popular of the music machines is the coin-operated phonograph, popularly called the *juke box*. Of slot machines for gambling, the most familiar is the "slot" or "jackpot" machine. It has a series of reels which start spinning when a coin is deposited and a lever on the side is pressed down.

The United States is the greatest slot machine producer in the world. Before 1939 England and Germany probably built better vending machines than the United States. W.W.HU.

**SLOVAK, SLO vak.** There are about 2,500,000 Slovaks living in Czechoslovakia. They are Slavs, descended from Rumanian Vlach colonists. The Slovaks look somewhat like the Czechs, but most Slovaks look more like eastern Slavs than like the people of Bohemia. The Slovaks are shorter and smaller-headed than the Czechs. Most Slovaks have snub-noses, broad faces, and blond hair.

Early Slovakia, Moravia, and Bohemia made up a mighty kingdom until the death of King Svatopluk in A.D. 894. Then the Slovaks came under the rule of the Magyars of Hungary. The Slovaks were abused and mistreated under foreign rule, but they managed to keep alive the Slovak spirit.

In 1867 the new government of Austria-Hungary passed laws to protect all nationalities. But the laws were not enforced and the Slovaks continued to suffer. After World War I, the Slovaks joined the Czechs to form the independent republic of Czechoslovakia. Adolf Hitler and the Nazis destroyed the new republic in 1939. But at the end of World War II, the Slovaks and the Czechs once more set up their republic. W.M.KR.

See also CZECHOSLOVAKIA; SLAV.

**SLOVAKIA, sloh VAHK ih ah,** is a territory which makes up the eastern part of Czechoslovakia. It is called Slovensko in the Czech language. For almost a thousand years, Slovakia suffered under the harsh rule of the Magyars of Hungary. In 1918 the Slovaks united with the Czechs to form the independent republic of Czechoslovakia. In 1939 Slovakia became an independent state under German domination. Much Slovak territory was transferred to Hungary. After the German defeat in 1945, Slovakia again became part of Czechoslovakia.



Location Map of Slovakia

Slovakia covers an area of 18,921 square miles, and has a population of 3,329,793. Bratislava is the capital of Slovakia. B.W.W.

See also BRATISLAVA; CZECHOSLOVAKIA.

**SLOVENIA, sloh VE nih ah.** See YUGOSLAVIA.

**SLOWWORM.** See BLIND WORM.

**SLUDGE.** The forming of sludge is the last step in the breaking up of ice sheets or icebergs in the ocean. Sludge is made up of small bits of ice massed together in the water before melting completely.

**SLUG.** A slug is a snail without a large coiled shell. Its shell is very small, flat, and internal, or entirely lacking. It has two pairs of tentacles with eyes on the



L. W. Brownell

**The Slug Leaves a Wake of Slime** when it crawls. This slime comes out of its body to lubricate sliding and to protect its underparts. If a razor blade were placed edge up in a slug's path, the slime would allow the slug to crawl over it unhurt.

outer end of the longer pair. As it crawls along it gives off a slimy mucus to make the crawling easier.

The great gray slug was introduced from Europe and is now a pest in greenhouses throughout the east. It is about four inches long and is a voracious eater. Some florists sprinkle ashes and cinders around plants they wish to protect from slugs which are suffocated when they crawl over the rough dry, dusty cinders. W.J.C.

**Classification.** Slugs belong to the genus *Limax* in the family *Limacidae*. The great gray slug is *Limax maximus*. The small common slug is *Agriolimax campestris*.

**SLUM CLEARANCE.** See HOUSING; TENEMENT.

**SLUR.** In music, a slur is a slightly curved mark which connects two or more notes. It indicates that these notes are to be sung to the same syllable, or sung without breaking the tone.

**SLURRY.** See CEMENT (In the Kilns).

**SLUTER, CLAUS.** See SCULPTURE (Germany).

**SMALLMOUTH.** See BASS.

**SMALLPOX** is one of the most contagious of known diseases. All ages and all races can be attacked by the disease. For many centuries smallpox was one of the greatest scourges of mankind. Now it can be prevented almost entirely by vaccination. By this means, as well as by quarantine, smallpox is kept in check. Sometimes over 30 per cent of the persons attacked die, while in mild epidemics the death rate may be less than 1 per cent.

Smallpox is caused by a very small germ, of the group known as *filtrable viruses*. Like many other diseases, smallpox is probably carried by the tiny droplets that are shot out into the air in coughing, sneezing, or even

talking. These germ-carrying droplets from an infected person find their way to the mucous lining of the nose and throat of another person. From there invasion of the rest of the body takes place. The germ also is present in skin eruptions. Therefore transmission may take place indirectly through clothing, bed clothes, and utensils.

The first symptoms appear ten to fourteen days after exposure. These are often a severe chill, headache, nausea, pains in the back and limbs, and fever. Usually on the third or fourth day after onset, the typical eruption begins in the form of red spots on the skin. There are hard lesions buried in the skin. These spots become raised and in a few days change to blisters which are soon filled with pus. They reach their largest size on about the fourteenth day. The eruption usually appears first on the face and arms, then on the trunk and legs. The location of these spots helps physicians to tell smallpox from similar diseases. If the crisis is passed safely the skin pustules dry up, the fever drops, and improvement begins. Scabs are formed which eventually drop off. They leave red or brown discoloration underneath. If the eruption has been severe, pits are left in the skin which may never disappear. These are the dreaded pockmarks.

There is no specific cure for smallpox. The best procedure is to use the known methods of prevention, the most effective of which is vaccination. The number of cases of this disease does not depend on sanitation. It depends on the number of unvaccinated persons in the population. Smallpox may occur, however, if the person has been vaccinated more than five years previous to exposure. The vaccination usually protects for 20 years, and limits the severity of infection. J.L.L.

See also VACCINATION.

**SMALT.** See COBALT.

**SMARTWEED** is an annual herb which grows as a weed in North America. It produces pink or green flowers and reaches a height of five feet or less. It grows in low places and sometimes in water. The most common smartweed also is called *lady's-thumb*. P.C.S.

**Classification.** The Smartweed belongs to the genus *Polygonum* of the family *Polygonaceae*. The lady's-thumb is *Polygonum persicaria*.

**SMELL**, also called **OLFACTION**, is one of the most important senses in animals. It is less important in man than in some animals, however. Like sight and hearing, it is one of the senses that can give information about distant objects. Many lower animals probably get most of such information through smell. In man, sight has taken over much of the work of the sense of smell, and the sense of smell has grown weaker.

Smells are caused by particles in the form of gases and vapors in the air. These particles spread rapidly, and can be carried long distances. The kinds of animals called *vertebrates*, which breathe in air, have their organs of smell in the lining of the nose.

Some fishes and other water animals also have olfactory organs, but they are often more like the organs of taste. Insects have many olfactory organs in their antennae.

In man the olfactory organs are at the top of the nasal cavity. They take up about 2.5 square centimeters in each nostril. Liquid from the lining of the nose keeps

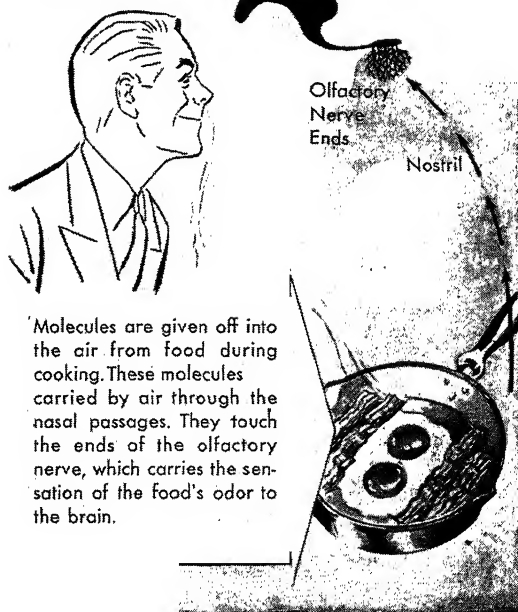
the organs damp, and the vapors dissolve in this liquid. The chemicals of the solution then stimulate the organs. The organs of taste act the same way, but they must actually touch the object. The olfactory organs themselves are nerve cells that end in hairlike cilia at the surface of the mucous membrane. These cells lead to the olfactory nerves, which end on each side in an olfactory bulb. The bulb forms the front part of one of the olfactory lobes of the brain. The olfactory lobes are in the front of the brain on each side of the central cleft. They take up much more of the brain in animals than in man.

Many "tastes" are really blends of tastes and smells. If a person holds his nose, he may find it very difficult to tell the difference between a piece of onion and a piece of apple. It also has been found that some smells are made up largely of feelings, since there are organs of feeling in the lower part of the nasal lining. For example, a camphor or menthol smell is partly a feeling of cold, and the sharp odor of ammonia or chlorine is partly pain.

Scientists are not sure how to classify the different smells. It is usual just to name the odor by the object it comes from, as an odor of rose, or tar. One such classification includes the following: spicy (clove, cinnamon), flowery (heliotrope, vanilla), fruity (orange oil, ether), resinous (pine needles), putrid (decay, hydrogen sulfide), and burnt (tar). Other odors can usually be fitted between some two of these six. For example, roasted coffee is placed between resinous and burnt, while peppermint is between fruity and spicy. Other scientists have found that organic substances of similar chemical make-up have similar smells. They have attempted to use this fact to classify the smells.

While smell is not the most highly developed sense

## OUR SENSE OF SMELL



in man, it is very sensitive. The organs can react to some vapors when there is only one part in one million parts of air. Artificial musk can be smelled when there is only .00004 milligrams per liter of air. The organs of smell easily become tired, and grow insensitive to a smell after being with it a few minutes. But they remain sensitive to a new smell. There also are *complementary* smells that cancel each other. Gardenia acts in this way against orange blossom, while carbolic acids mask the odor of decay.

G.W.BE.

See also BEE (Antennae); NOSE; TASTE.

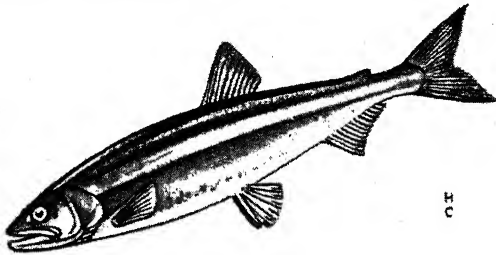
**SMELLING SALTS** are used to relieve faintness and headaches. They are made up of ammonium chloride mixed with perfume. This drug is known as a stimulant because it causes the breathing organs to work more actively.

The ammonia fumes given off by the salts irritate the membranes of the nose and cause the muscles of the breathing organs to work more quickly. Smelling salts usually come in white crystals.

A.E.S.

See also AMMONIA.

**SMELT.** The smelts make up a family of fish much like the salmon, but they are smaller and have larger scales. Their stomachs also are different from those of

H  
C

**The Smelt** lives in salt water but runs up coastal streams to spawn. Great Lakes smelts are caught in great numbers for food.

the salmon. All smelts live in the cool waters of the Northern hemisphere. They are salt-water fish, but some species go up rivers to spawn. A few stay permanently in fresh water.

The common *American smelt* swims along the Atlantic Coast between the Gulf of Saint Lawrence and New York. It is trapped in several northern lakes, and has been brought to the Great Lakes, where it is now very abundant. Smelts enter the streams and rivers to spawn in the winter and are caught through holes in the ice.

The smelt's body is a transparent greenish above, and silvery on the sides. Its average length is eight or ten inches. Some large smelts have been caught that are over a foot long and weigh about a pound.

Smelts are valuable food fish and are marketed in large numbers. They are usually sold frozen, but the unfrozen, or "green" fish are considered a greater delicacy.

C.L.HU.

See also CANDLEFISH.

**Classification.** The American smelt is *Osmerus mordax*, in the family *Osmeridae*.

**SMELTING** is a method by which metals are taken from their original ore. Smelting is done in specially built furnaces. The blast furnace for making pig iron is the most common type of smelter. In this smelter

the ore is put into the top of the furnace with coke or coal dust and lime. The lime melts first under terrific heat, and forms a liquid. The iron sinks to the bottom of the furnace. The impurities, called *slag*, are drained off above the iron. The pig iron in molten form is then taken from the bottom of the furnace.

Another type of smelter is the *reverberatory* furnace used to refine copper. In this smelter the copper sinks to the bottom in a form called *matte*, which contains iron sulfide and sometimes small amounts of other metals. The matte is further refined to get copper.

See also BLAST FURNACE; FLUX; IRON AND STEEL (How Iron Is Made); METALLURGY; SLAG.

**SMETANA, SMI** *tah nah*, **BEDRICH** (1824-1884), was a composer and conductor who has been called the "Beethoven of Bohemia." He was born at Leitomischl, Bohemia. Smetana is best known as the composer of the opera *The Bartered Bride*, one of the greatest of all folk operas. *My Country*, a series of six symphonic poems, is another of his masterpieces.

G.B.

**SMILAX, SMI** *lacks*, is a group of woody or herbaceous vines with hardy, tuberous roots and veined evergreen leaves. The stems end in tendrils by which the plants climb. The plant grows in both temperate and tropical climates. The best-known American forms are the carrion flower and the greenbrier. Several tropical species give us sarsaparilla, and a sweet tea is made from the leaves of others. Some of the smilax plants have stems which can be worked into baskets. In some of the Southern States, beer is made from smilax roots, and hogs are fattened on them.

A graceful hothouse plant is often called smilax, but it is related to asparagus.

J.J.L.

See also GREENBRIER; SARSAPARILLA.

**Classification.** Smilax is a genus in the *Liliaceae* family.



J. Horace McFarland

The Leaves and Berry Clusters of Smilax

**SMITH, ADAM** (1723-1790), was a famous Scottish economist. His great book, *The Wealth of Nations*, is considered the foundation of modern economics.



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**Adam Smith**, Scottish economist, founded many theories of capitalism.

length work on political economy. The book states that labor, and not land or money, is the real source of a nation's wealth. It also favors free trade and opposes any government control of the laws of supply and demand. The book draws its general principles from actual facts, instead of theories. It long served as a guide to economists. Later studies of economics have followed the general plan and principles set forth in his work.

Smith was born at Kirkcaldy, Scotland. He was educated at the University of Glasgow and at Oxford University. When he was twenty-five he went to Edinburgh, where he became noted as a lecturer on literature and philosophy. In 1751 he was appointed professor of logic, and later of ethics, in the University of Glasgow.

After twelve years he resigned from the university, and traveled with the Duke of Buccleuch for three years as his teacher and companion. On his return to Scotland he devoted ten years to study and writing. In 1776 he published *The Wealth of Nations*. Just before his death he was elected Lord Rector of the University of Glasgow.

H.U.F.

**SMITH, ALFRED EMANUEL** (1873-1944), was an American political leader. He was elected governor of New York four times, and in 1928 was an unsuccessful candidate for President of the United States.

Smith was born on the lower East Side of New York City. He left school at the age of twelve and sold newspapers in the streets. Smith also worked for seven years in the Fulton Fish Market of New York City. Years later, in speaking of his lack of education, Smith boasted that he had the degree of F.F.M.—Fulton Fish Market.

At twenty-two Smith became interested in politics. He worked his way up until he was elected to the state legislature in 1903. By this time he had become one of the leaders of the Democratic party. In 1918 he was elected governor of New York.

In 1924 Smith was unsuccessful in obtaining the Democratic party's nomination for President. But four years later he won the nomination with the help of his friend and associate, Franklin D. Roosevelt. "The Happy Warrior," as Roosevelt called him, lost the election to Herbert Hoover in a campaign that played



Wide World  
**"Al" Smith**, New York political leader, whom Franklin D. Roosevelt nicknamed "The Happy Warrior"

up prejudice on religion and prohibition. In later years, Smith broke with Roosevelt.

E.E.R.O.

**SMITH, DONALD ALEXANDER.** See STRATHCONA AND MOUNT ROYAL, D.A.S., BARON.

**SMITH, EDMUND KIRBY.** See KIRBY-SMITH, EDMUND.

**SMITH, FRANCIS HOPKINSON** (1838-1915), was a noted American architect and engineer. He was as well known for his hobbies of painting and writing as he was for his professional accomplishments. He was born in Baltimore, and learned civil engineering while working in foundries. Later he became a successful designer and builder of lighthouses, sea walls, and other masonry works. Smith built the foundation for the Statue of Liberty in New York Harbor.



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**Francis Hopkinson Smith**, American writer, artist, architect, and engineer

Later in life Smith devoted most of his time to painting. His landscapes in water color and his charcoal drawings won him many medals. He also wrote popular novels and travel books. His most successful novel, *Colonel Carter of Cartersville*, was made into a play.

L.J.

His Works include *A Gentleman Vagabond*; *Caleb West*; *Master Diver*; *The Fortunes of Oliver Horn*; and *Outdoor Sketching*.

**SMITH, FREDERICK M.** (1874-1946). See LATTER DAY SAINTS, REORGANIZED CHURCH OF.

**SMITH, GERRIT.** See NEW YORK (Famous New Yorkers).

**SMITH, GOLDWIN** (1823-1910), was a Canadian editor and historian. He was born in Reading, England, and came to Canada in 1871, after teaching at Oxford University and Cornell University, Ithaca, N.Y. He founded *The Week* and *The Bystander* in Toronto. His writings included histories of England and Ireland and commentaries on politics and economics.

**SMITH, HOKE** (1855-1931), was an American journalist, lawyer, and political leader. He was born in Newton, N.C., but after 1872 was a citizen of Georgia. From 1887 to 1896 he owned the *Atlanta Journal*. From 1893 to 1896 he served as Secretary of the Interior in President Grover Cleveland's cabinet, and was governor of Georgia from 1907 to 1909. He was United States Senator from 1911 to 1921.

E.S.W.

**SMITH, HOLLAND McTYEIRE** (1882- ), commanded United States Marines in some of the most hard-fought campaigns in the Pacific during World War II. Smith had already made a reputation as an expert on amphibious warfare. In 1939, he helped design many of the landing craft later used in the war, and in 1940 and 1941 he established a training program in ship-to-shore warfare which was followed by both the Marine Corps and the army.

Smith was born at Seale, Ala., and studied law at the University of Alabama. After three years' law practice he became a lieutenant in the Marine Corps.

In October, 1942, Smith joined the Amphibious



Corps of the Pacific Fleet. He led the landings on Makin and Tarawa islands, as well as on Kwajalein. In July, 1944, he was named commander of the Fleet Marine Force, and in that position directed the battles for Saipan and Iwo Jima. His determination and toughness in combat gave him the nickname of "Howlin' Mad." He retired in 1946. F.S.M.

**SMITH, HYRUM** (? -1844). See MORMON (History of the Church).

**SMITH, JEDEDIAH STRONG** (1798-1831), was an American trader and explorer. He was born in Bainbridge, N.Y., and received a fair education. As a young man, Smith moved to the West and entered the fur trade. After several years in the employ of General William Henry Ashley, in 1826 Smith began the first of the explorations for which he became famous. He wanted to find out if there was a practical route from California to Oregon. He left Great Salt Lake with seventeen men and traveled through the Ute and Paiute Indian territories and across the Mojave Desert until he reached Mission San Gabriel in California. There the Spaniards kept him from heading north. Smith retraced his route the following year, but ten of his party were killed by Indians along the way. On another journey from California to Fort Vancouver (now Vancouver, Wash.), Smith again barely escaped with his life. Several years later, he was killed by Indians while leading a caravan over the Santa Fe Trail. T.R.H.

**SMITH, JESSIE WILLCOX** (? -1935), was an American artist noted for her portraits of children and her illustration of books for children. Her ability to catch the typical poses and expressions of children made her pictures appealing to both children and adults. She was born in Philadelphia, and first studied to become a kindergarten teacher. But she discovered that she could draw well, and then studied art. She took courses at the Pennsylvania Academy of Fine Arts and at the Drexel Institute under Howard Pyle. Jessie Smith illustrated more than twenty books besides painting many portraits of children. The books she drew pictures for include *A Child's Garden of Verses*; *At the Back of the North Wind*; *Little Women*; *Heidi*; *Mother Goose*; and *Water Babies*. H.B.O.

**SMITH, JOHN** (1580-1631), was a famous English adventurer. He is remembered as the leader of the first English colonists in Virginia.

Smith was born at Willoughby, in Lincolnshire. He attended grammar school and was apprenticed to a merchant. Soon afterward, Smith left this position to seek adventure. For four years he was a soldier in Europe. Afterward he served in the Protestant wars against the Saracens. The rest of his early life is told in his book *The True Travels, Adventures, and Observations of Captain John Smith, in Europe, Asia, Africa, and America*. His adventures, as he told them, were very unusual and historians do not entirely believe them. Smith claimed that he killed three gigantic Turks in single combat in Transylvania and received for this deed a coat of arms with three Turks' heads. Smith also stated that he was captured in the Battle of Rothen-thurm and was sold as a slave. He said he was given to the wife of the Turkish Pasha, and she fell in love

with him. But Smith wanted to be free, and he killed his overseer and escaped to England.

In 1606 Smith sailed in the expedition that founded the colony of Virginia. He was supposed to become one of the leaders of the colony as soon as they were safely settled. But he was not allowed to serve as a leader because of an attempt at mutiny aboard ship. Smith instead spent his time exploring the countryside and getting corn and other food from the Indians for the



J. B. Lippincott—from *The Erecting Adventures of Captain John Smith* by Vernon Quinn

**John Smith Struggling with an Indian Chief** who had attacked him by surprise. Smith got his knife hand free, and the Indian surrendered. The savages hoped to starve the Jamestown settlement by ambushing their hunters.

colonists. On one of these expeditions the Indians captured Smith and condemned him to death. He claimed that Pocahontas, the daughter of the Indian chief, saved him by throwing her body on his when the executioner's ax was about to fall. This story also is doubted.

Smith returned to Jamestown in January, 1608. From September, 1608, to July, 1609, he served as president of the colony's governing council. He saved the colony from starvation by forcing the men to work and by buying corn from the Indians. He also explored the country and made a map of Virginia.

In 1609 wounds Smith received in a gunpowder explosion forced him to return to England. He returned to America in 1614 and explored the New England coast. He made accurate maps and wrote interesting descriptions of what he saw. He was later given the title "Admiral of New England" for his many services. T.P.A.

See also JAMESTOWN; POCAHONTAS; POWHATAN; SARACEN; VIRGINIA (History).

## SMITH, JOHN MERLIN POWIS

**SMITH, JOHN MERLIN POWIS** (1866-1932). See **BIBLE** (Other Modern Versions).

**SMITH, JOSEPH**, and **JOSEPH FIELDING**, were leaders of the Church of Jesus Christ of Latter-day Saints, whose members are known as Mormons. They were



**Joseph Smith**, founder of the Mormon Church

uncle and nephew. Joseph Smith founded the church. His nephew played a large part in its growth.

**Joseph Smith** (1805-1844) was born in Sharon, Vt. In 1819 his family moved to Manchester, near Palmyra, N.Y., and the boy began working on a farm. The next year, during a time of much religious confusion, Smith could not decide which church he should join and so he prayed to God for guidance. Smith then claimed that he had received a vision in which God told him not to join any of the churches of the time because they were not the true churches of

Christ. This vision was the first of a series which led to Smith's reported discovery of a number of buried gold plates. Smith said these plates told the history of the true church of Christ and inspired Smith to restore this church on earth. The writings on these plates were later published and became known as the *Book of Mormon*.

In 1830, ten years after he had received his first vision, Smith founded at Fayette, N.Y., the Church of Jesus Christ of Latter-day Saints. The first members were Smith's family and his neighbors, but the membership of the new church grew rapidly. The religious spirit of the times contributed somewhat to the growth of the new religion, but probably the most important reason was the magnetic personality of its prophet, Joseph Smith. Shortly after the church was founded, Smith sent out a number of missionaries to all parts of the country. Sidney Rigdon, a pastor of the Church of the Disciples of Christ in Mentor, Ohio, was one of the first converts, and he became a guiding spirit in the new church. Rigdon established a Mormon church in Kirtland, Ohio, and Smith led his followers here in 1831. The Mormon Church was a co-operative society, and much of its organization was taken over from the experimental communistic societies of the time. The Mormons planned to build a great city at Kirtland. They first built a sawmill, a tannery, and a general store. They also built a great stone temple which cost about \$50,000. The membership of the church continued to grow. Among the new converts was Brigham Young, who soon became a power in the church. See **YOUNG, BRIGHAM**.

But from the beginning, there was trouble at Kirtland. The Mormons were unpopular with the townspeople and were often treated badly. Also, there were quarrels within the church itself, and Smith almost lost his position as leader. In spite of these difficulties, the details of the church organization were worked out here.

Smith had always wanted to establish his church farther west, and in 1830 he had sent many settlers to Missouri. His original purpose in going west was to convert the Indians, as he believed the Indians were descendants of the children of Israel. But the Indians refused to accept the religion, and the missionaries converted the more willing whites instead. There were many large communities in Missouri, and so, in 1838, when the Mormons were driven out of Kirtland, Smith and Rigdon fled to Missouri.

## SMITH, KATE

• Mc

his followers to a settlement on the Mississippi R. In Illinois, Smith named this town Nauvoo, or "the city beautiful." He received from the Illinois state legislature a charter which gave the city almost unlimited powers. Smith also was permitted to establish a military organization called the Nauvoo Legion, in which he held the rank of lieutenant general. The city grew rapidly and schools were soon set up. The Mormons planned to build a university and they also laid the foundation for a new temple.

Smith was at this time at the height of his power. He ruled the Mormon church and community by "revelations," or visions, in which the Lord told him what to do. But as he became more powerful, his church became more unpopular. The nonmembers, or "gentiles," as they were called, were jealous of the political power of the Mormons. They became even more outraged when Smith announced that he was running for President of the United States. At this time Smith established the practice of polygamy, which permitted a man to have more than one wife. When news of this new doctrine leaked out it made the townspeople even more angry, and even outraged many of the Mormons. They started a newspaper, the *Nauvoo Expositor*, which attacked polygamy and Smith's political ambitions.

Smith and his followers destroyed the newspaper and chased the editors out of town. Smith was later arrested for this act and taken to the Carthage jail. While he was waiting trial, a mob broke into the jail and he and his brother Hyrum were killed.

**Joseph Fielding Smith** (1838-1918) was the first president of the Mormon Church to be born of parents who were members of the church. He was born in Far West, Mo., the son of Hyrum Smith, and the nephew of Joseph Smith. When he was ten years old his mother moved to Utah with the rest of the Mormons. At the age of fifteen, he was sent on missions to Hawaii and Great Britain, where he made many converts. Smith rose rapidly in the Mormon Church, and in 1901 was chosen president. In 1904 he was summoned before the United States Senate and questioned about polygamy. He testified that the Mormon Church no longer approved of the practice. Smith did much to strengthen the Mormon Church by his friendly relations with nonmembers in Utah and elsewhere.

E.D.T.

See also **LATTER DAY SAINTS; REORGANIZED CHURCH OF MORMON; POLYGAMY; SALT LAKE CITY; UTAH**.

**SMITH, KATE** (1909- ), is an American radio singer. Her name is often associated with Irving Berlin's patriotic song, "God Bless America," which she introduced over the radio in 1938. Kate Smith was born in Greenville, Va., and was given the name Kathryn Elizabeth. She grew up in Washington, D.C., where she sang for the Liberty Loan drives of World War I. At seventeen she became a musical comedy actress. In 1931 she began to sing over the radio.

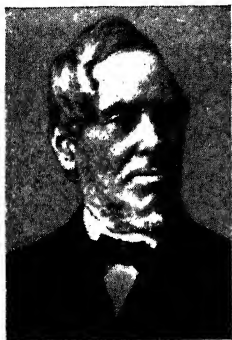


**Kate Smith**, popular singing star of radio and screen

Within four years her pleasant voice and personality brought her to the height of success. During World War II she sold bonds by radio and traveled thousands of miles to sing in army camps.

G.S.B.

**SMITH, SAMUEL FRANCIS** (1808-1895), was an American clergyman and poet, who wrote the words to the patriotic hymn "America." Smith was born in Boston, and was graduated from Harvard University in 1829, in the same class with Oliver Wendell Holmes and James Freeman Clarke. He continued his studies at Andover Theological Seminary, and was ordained a Baptist minister in 1834. In that year he became pastor at Waterville, Me., and professor of modern languages at Waterville College.



Brown Bros.

**Samuel F. Smith**, Baptist clergyman who wrote the words for "America"

He served as minister at Newton, Mass., from 1842 to 1854, and while there he edited *The Christian Review*. After 1854, he devoted most of his time to the work of the American Baptist Missionary Union. G.T.

See also AMERICA.

**His Works** include many hymns, such as "The Morning Light Is Breaking," and travel books, such as *Missionary Sketches* and *Rambles in Mission Fields*.

**SMITH, SYDNEY** (1771-1845), was an English clergyman and humorist. He was one of the most famous wits of his time, and was noted for his good-natured, whimsical humor. Probably his best-known work is the *Peter Plymley Letters*, which satirized the attitude of the country clergymen toward the restrictions on Roman Catholics. Catholics were not permitted to vote or hold office at this time, and Smith's works played a great part in securing these privileges for them.

Smith was born at Woodford, Essex, and was educated at Oxford University. In 1794 he was ordained. Two years later he moved to Edinburgh where he taught and occasionally preached. He became one of the founders of the *Edinburgh Review*, and wrote for this magazine for twenty-five years. From 1831 until his death he was a resident canon at Saint Paul's Cathedral in London. G.E.B.

**His Works** include *Letters on the Subject of the Catholics and On American Debts*.

**SMITH, THEOBALD** (1859-1934), was one of the greatest American investigators of disease in both human beings and domestic animals. He was born at Albany, N.Y., and was educated at Cornell University and the Albany Medical College. He became head of the pathological laboratories of the Bureau of Animal Industry of United States Department of Agriculture when they were established in 1884, and was professor at Columbian (now George Washington) University. From 1896 to 1915 he was professor of pathology at Harvard University and director of the pathological laboratory of the Massachusetts Board of Health. From 1915 to 1929 he was director of the department of animal pathology at the Rockefeller Institute for Medical Research.

Smith pioneered in studying bacterial germs of disease and immunity to them. In 1886 he separated the

germs of swine plague from those of hog cholera and showed how to prevent hog cholera. With F.D. Kilborne he discovered the cause of Texas fever in cattle and proved that the germs were carried by ticks. This discovery saved the Southern beef-cattle industry and established the study of insect-borne diseases. Smith also proved that germs of tuberculosis in cattle differ from those of human tuberculosis, and that they seldom infect human beings. C.L.F.

**SMITH COLLEGE** is a privately controlled liberal arts school for women at Northampton, Mass. The graduate school of architecture is in Cambridge, Mass.

The undergraduate body is limited by the Board of Trustees to 2,000. Thirty-four dormitory units afford accommodations for about 1,900 students. There is a limited number of scholarships to be applied to tuition. Opportunities are provided for students to earn part of their tuition.

Courses offered lead to bachelor's, master's and doctor's degrees. In normal times, the college conducts the Junior Year Abroad in France, Italy, and Spain. In 1944-1945 and 1945-1946, groups of junior class members studied in Mexico instead.

Smith College was chartered in 1871. The School for Social Work was founded in 1919. The Graduate School of Architecture and Landscape Architecture became part of the college in 1938. H.D.A.

**SMITH-HUGHES ACT.** The United States Congress adopted this act in 1917 to furnish Federal aid for vocational education. The act provides for payments to the states to help train teachers in agricultural, trade, home economics, and industrial subjects, and to help pay the salaries of such teachers. The act set up the Federal Board for Vocational Education, but later legislation has placed the administration of the law in the Bureau of Education and discontinued the Federal Board of Education. Most states have boards to cooperate in the administration of the act. The states also furnish equipment and outline courses of study approved by the Federal Board. More than two million students were enrolled under the provisions of the program in 1944.

Extensions of the act have made appropriations to set up a vocational rehabilitation program. T.L.B.

See also AGRICULTURAL EDUCATION; HOME ECONOMICS.

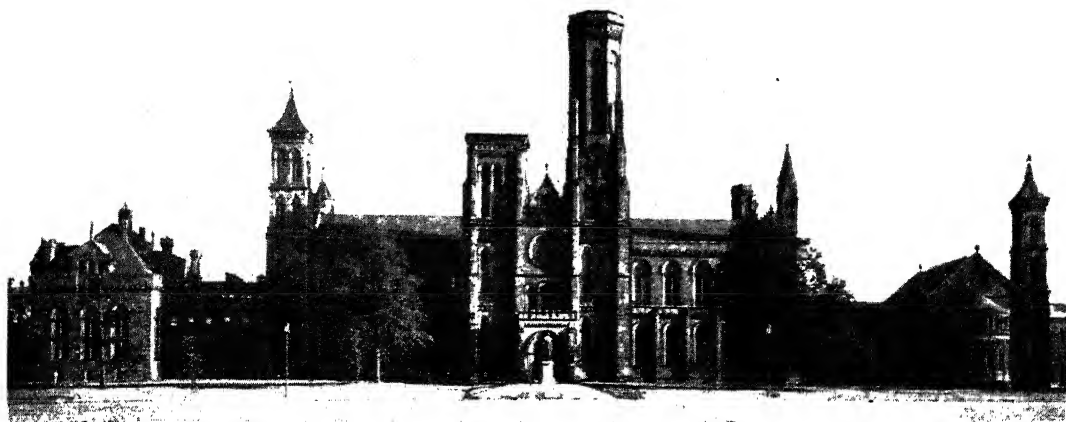
**SMITH-LEVER ACT.** See AGRICULTURAL EDUCATION (Agricultural Extension Work).

**SMITHSON, JAMES** (1765-1829), was a British scientist and founder of the Smithsonian Institution. In his will he gave more than \$500,000 to the United States to establish a scientific institution. Congress accepted this gift and in 1846 created the Smithsonian Institution at Washington, D.C.

Smithson was born in France, the son of Hugh Smithson Percy, who was later Duke of Northumberland. He was educated at Oxford University. Smithson became known for his researches in chemistry and mineralogy. One of the many minerals that he studied was named *smithsonite* (zinc carbonate) in his honor. B.J.

See also SMITHSONIAN INSTITUTION.

**SMITHSONIAN INSTITUTION** is an institution of learning and research in Washington, D.C. It was



**The Smithsonian Building** was finished in 1852 on the Mall in Washington, D.C. It was built after the architect had visited Palestine, and the design reflects the architecture of the Near

East. It has a number of towers, turrets, and pinnacles. Inside the building are the Institution's offices, library, and "index exhibit" of the Smithsonian activities.

founded through a gift made by James Smithson, an Englishman who had never even visited the United States. This gift amounted to about \$550,000. Congress accepted it and passed an act on August 10, 1846, which established the Smithsonian Institution. Its purpose has been to increase knowledge by research, to make such knowledge available through publications, and to exchange it with other countries. Additional gifts have increased the fund to over \$2,500,000, of which \$1,000,000 is deposited in the United States Treasury, with interest at 6 per cent. The annual income and gifts total about \$248,000.

**Administration.** The Institution is not a Federal bureau, although the government accepted the Smithsonian gift in trust. A Board of Regents administers the Institution. The Vice-President and Chief Justice are members of this board because of their offices. The board also must be made up of three Senators, three Representatives, and six citizens, two of whom must live in Washington, D.C. Congress appoints all board members except the Vice-President and Chief Justice. The executive officer is a secretary selected by the Board of Regents. His office is not political. All the past secretaries of the Institution have held office until their deaths. The remainder of the personnel also are selected on their merits. The first secretary was Joseph Henry. He outlined a broad and general policy of administration which later secretaries have followed. Henry established the weather service and started exchanges of scientific publications with other nations.

**Activities.** The Smithsonian Institution administers several bureaus for which Congress grants funds. The library of the Institution contains nearly 900,000 volumes. These consist chiefly of the publications of other learned societies and of scientific periodicals. Most of them are housed in the Library of Congress, except for a sizeable working library kept at the Institution. Scientific research, exploration, publication, and the

care of the collections form the bulk of the Smithsonian activities. These are carried on to the limit of the resources, and the intentions of the founder are faithfully followed.

One of the outstanding activities has been the study of the effects of the sun on the weather. This is carried on by the Astrophysical Observatory.

Libraries and educational institutions may call on the Smithsonian for publications. The staff answers thousands of questions and requests each year. The Institution also receives many objects of national pride and interest for safekeeping. Lindbergh's airplane, *Spirit of Saint Louis*, and Wiley Post's *Winnie Mae* are at the Smithsonian. In 1948 the Institution completed plans for acquiring the Wright brothers' plane, which was flown at Kitty Hawk, N.C., in 1903. Orville Wright had sent the plane to England in 1928. See AIRPLANE (Famous Flights, Fliers, and Records).

**Division of Radiation and Organism** is a research unit under the administration of the Astrophysical Observatory. It was organized in 1929 for the purpose of investigating the effects of radiation on plant growth. This work was carried on through private support for twelve years. The staff has developed intricate and highly accurate scientific devices. They have obtained very important information about the effect of wave lengths of radiation on plant growth, and the way in which plants form the green coloring matter called *chlorophyll*. This process is known as *photosynthesis*.

**Astrophysical Observatory.** Secretary Samuel P. Langley (1834-1906) established this bureau in 1890. Congress made an annual grant of \$10,000 for it, and later increased this to \$30,000. The early investigations of Langley seemed to indicate that the sun's radiations varied, and as a result caused changes in the climate and weather. Research on this problem is carried on at various stations throughout the world. Important results have been obtained. These give definite promise of long-range weather forecasting.

**Bureau of American Ethnology** was instituted in 1879. Its purpose is to preserve ancient American relics and

the history, culture, habits, customs, and languages of the American Indians. The reports and bulletins published by this Bureau are invaluable to the student of American Indian life. Major John W. Powell, the first director, carried on extensive investigations in the Southwest regions. He discovered important material about the origin and life of the early Indians. The Bureau conducts explorations and surveys constantly, and frequently reports notable discoveries.

**International Exchange Service** distributes the publications of the Institution and receives publications of a similar nature from countries throughout the world. This exchange system was worked out under the direction of Secretary Joseph Henry in 1850. Various nations agreed to this arrangement by a treaty drawn up at Brussels in 1886. The treaty provided for international co-operation in the free exchange of scientific and other publications. Peacetime exchanges with nearly every nation aid greatly in the advance of knowledge.

**National Gallery of Art.** Andrew W. Mellon gave his famous art collection to the Smithsonian Institution in 1937. He also provided funds to erect a marble building to house it, to be known as the National Gallery of Art. It was completed and opened in March, 1941. The National Gallery is administered by a board of trustees, of which the secretary of the Smithsonian is a member. The collection has a large number of paintings of the first rank by old masters. Important additions also have been made to it. The most notable is the famous collection of Italian paintings and sculptures given by Samuel H. Kress in 1939.

**National Collection of Fine Arts.** This bureau of the Smithsonian Institution is housed in the National Museum. It contains many fine paintings, portraits, and other art works, including the collections of Harriet Lane Johnston, William T. Evans, and Ralph Cross Johnson. The Collection was formerly known as the National Gallery of Art.

**Freer Gallery of Art.** This is a separate unit of the National Collection of Fine Arts. It was opened in 1923. Charles L. Freer presented to the United States his collection of rare Japanese, Chinese, and American art, and erected a beautiful building to house and display it. In addition, Mr. Freer gave about \$3,000,000 to be used for the gallery, and for further researches and collections of Oriental art.

**National Zoological Park.** This was established in Washington in 1890. It contains about 2,400 animals of more than 700 species. One of the objects of the establishment is the preservation of certain rare American animals which threaten to become extinct. The park occupies 167 acres.

**National Museum of the United States.** See separate article under that title.

See also HENRY, JOSEPH; LANGLEY, SAMUEL PIERPONT; NATIONAL GALLERY OF ART; POWELL, JOHN WESLEY.

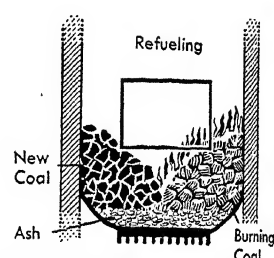
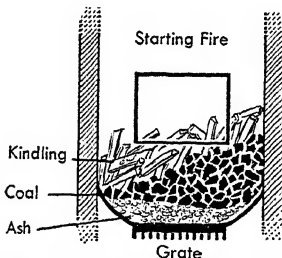
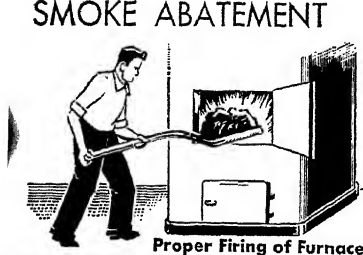
**SMITHSONITE.** See ZINC.

**SMOKE BALLS.** See MUSHROOM (Harmless Varieties).

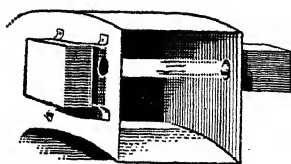
**SMOKELESS POWDER.** See GUNPOWDER.

**SMOKE PREVENTION.** Every community has the im-

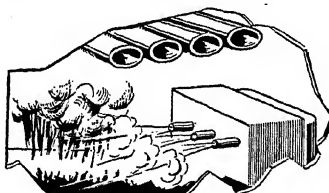
## SMOKE ABATEMENT



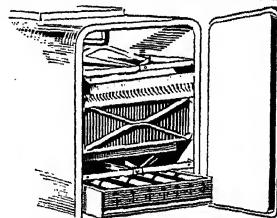
### Devices to Control Smoke



Air jets over fire cause smoke-making gases to burn in furnace.

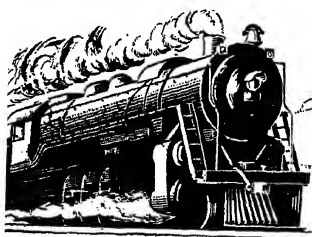


Electric-eye in smoke pipe rings bell to warn when smoke is too thick.

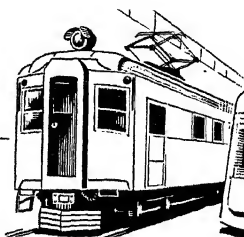
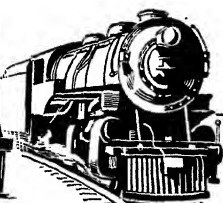


The precipitron cleans air electrically as it leaves hot-air furnace.

### Control of Railroad Smoke



Air jets over fire in locomotive burn smoke-making gases



Electric

Diesel Electric

**Locomotives Using Smokeless Power**



## SMOKE SCREEN

portant job of keeping the air free from smoke. Smoke is a great nuisance in cities, where there are many furnaces and boilers. Smoke is harmful to man and to plant life.

Smoke is a mixture that comes from burning any kind of material, such as coal, wood, or petroleum. Smoke is made up of water vapor, carbon dioxide, and other gases that can not be seen. Yet smoke itself can very clearly be seen. This is because smoke is made up mostly of tiny particles of carbon that have not been burned. These tiny particles are black in color and are known as soot. In some cities as much as a hundred thousand tons of soot comes from chimneys each year. This means that there is a great deal of waste of coal and other fuel.

Smoke is harmful not only because it is wasted fuel. It also is very harmful to health. Smoke in the air makes cities look dark and cuts out a great deal of sunlight. What is more important is that smoky air is bad for the nose, throat, and lungs. It has been found that the breathing of smoke-filled air increases sinus trouble, nose trouble, tuberculosis, and pneumonia. Smoke also is harmful to plants and trees. Sulfuric acid is a chemical found in smoke which is poisonous to plant life. Smoke also harms the outside of buildings and causes metals to wear away. People who live in cities have difficulty keeping clothes, curtains, and furniture clean. Millions of dollars are spent each year for cleaning bills.

We can easily see that the damage caused by smoke is a serious problem. This problem has been solved in many cities by trying to remove the cause of smoke. First of all, it has been found that much of the smoke in the city is caused by burning soft coal. To remedy this, hard coal, fuel oil, natural gas, and coke have been used as fuel. It also is known that the tiny pieces of soot are actually pieces of fuel that have not been burned. Engineers have designed better types of furnaces, and also have been educating people in the proper methods of making a fire so that there will be less soot. An automatic stoker has been developed which feeds the fire no faster than the coal is burned. Special fans and flues have been made to give the furnace the right kind of a draft.

There is no such thing as a "smoke consumer," and smoke once formed by incomplete combustion can not be consumed. The only effective way is to prevent the formation of sooty smoke by improving the ways in which the fuel is burned.

Many cities have laws which are meant to reduce the amount of smoke. In some cities, such as New York City, all railway trains within the city limits must use electricity. In other cities, only certain types of coal may be used. The use of electric locomotives in cities is increasing as a result of the effort to curtail smoke. Certain places use devices which remove smoke from the air. One smoke-removing device is called a *precipitron* and is worked by electricity. Smoke prevention is still a major problem which must be solved before many cities can become satisfactory places in which human beings can live and work.

E.A.Fe.

See also COLLOID; SOOT.

**SMOKE SCREEN.** See BOMB (Other Types of Bombs).

**SMOKE SIGNAL.** See INDIAN, AMERICAN (Languages, Signs, and Smoke Signals).

**SMOKING.** See TOBACCO.

## SMUDGE POT

**SMOKY MOUNTAINS, GREAT.** See GREAT SMOKY MOUNTAINS.

**SMOLENSK.** See UNION OF SOVIET SOCIALIST REPUBLICS (Cities).

**SMOLLETT, TOBIAS GEORGE** (1721-1771), was a British novelist. He is chiefly noted for the part he had in the early development of the English novel. Smollett set the example for the novel of the sea, and some writers have said that all who afterward wrote of the navy copied more from Smollett than from real life. His novels are known for their coarse and lively humor. They are not well constructed and are made up mainly of amusing and thrilling incidents from his own experiences in the navy.



Tobias Smollett, one of the first English novelists

Smollett was born near Dumbarton, Scotland, and studied medicine at the University of Glasgow. In 1739 he enlisted as a surgeon's mate in a British naval expedition to the West Indies. Smollett took part in the attack on Cartagena, Colombia, in 1741. Later he married the daughter of a wealthy Jamaica planter and returned with her to London.

From that time on Smollett devoted himself entirely to writing, and in 1748 published his first novel, *Roderick Random*. In 1769 he left England and settled in Italy, where he lived for the rest of his life.

L.J.

His Works include *Peregrine Pickle* and *Humphry Clinker*.

**SMOOT, REED** (1862-1941), was United States Senator from Utah for thirty years (1903-1933). He also was one of the leaders of the Church of Jesus Christ of Latter-day Saints. He was born in Salt Lake City, Utah, and was graduated from Brigham Young Academy at Provo in 1879. In 1900 he was made an apostle in the Church of Latter-day Saints.

For many years, Smoot served as chairman of the Senate Finance Committee. Tax and tariff problems were his special assignments, and he was co-author of the Smoot-Hawley tariff law. Smoot was a rigid believer in economy and efficiency in government. He established the United States Bureau of Efficiency. Smoot was a member of the World War I Foreign Debt Commission. See Tariff.

E.E.Ro.

**SMOOTH FOX TERRIER.** See Dog (color plate, Terriers).

**SMUDGE POT.** A smouldering fire used for combating frost is burned in smudge pots. Clear air conducts heat readily, but smoke does not. Therefore, if a layer of smoke can be placed over tender vegetation on clear, cold nights when frost is forming, the plants may be saved. Smoke from almost any sort of fuel will do for a smudge pot—hay, damp leaves, old rubber, or oil waste.

In order for a smudge pot to work effectively, the air over the plants must be calm. Wind will blow the smoke away, leaving the plants without frost protection. The valleys of California are good locations for smudge pots,



Gendreau

**Smudge Pots Are Necessary Equipment** in an orange grove. When frost threatens, they are lighted to protect the fruit.

because they are surrounded by high hills. Smudge pots do not work so well in Florida and southern Texas, where the land is flat.

U.P.H.

**SMUGGLING.** Most countries have officers stationed at seaports and at various points on their borders. The officers see that import duties, or taxes, are paid on goods brought into the country. They examine both shipments of merchandise and the personal baggage of travelers. Some people try to avoid payment of duties, either by deceiving the officers or by taking goods in at some point where officers are not stationed. This practice is called *smuggling*.

Sometimes a country may have laws entirely prohibiting the importation of a particular article. For example, the United States once prohibited the importing of alcoholic liquors. Violation of such laws also is called smuggling. During the prohibition period in the United States, the illegal manufacture, sale, or transportation of alcoholic liquors was sometimes referred to as *bootlegging*.

Smuggling may be punished by fining or imprisoning the offender, or by taking his goods, according to the seriousness of the offense. In the United States, no one is held guilty of smuggling unless he has acted intentionally, with full knowledge that he is doing something unlawful. See also CUSTOMS DUTIES.

H.CAL.

**SMUT** is a fungus which lives as a parasite in certain plants and causes diseases in them. Smut gets its name from the fact that it produces tiny black spores that look like particles of soot. Smuts are very dangerous to both cultivated and wild plants. They are particularly harm-

ful to agricultural crops such as wheat, oats, barley, corn, and rice. Smuts usually destroy the seeds or entire clusters of flowers. This may result in the plant's becoming completely useless or unable to produce seeds.

One of the most common of all smuts is the *corn smut*. This smut causes the loss of millions of bushels of corn each year. Corn smut is usually found on the ears of corn plants, causing large growths which resemble boils. Sometimes these growths also occur on the tassels. The spores of corn smut may live in the soil, or in manure which has come from animals fed with infected corn stocks. These spores may later infect plants with which they come in contact. As the corn plant develops, the tiny threads of smut grow within the tissues of the plant. These threads produce large blotches of dark-brown spores in the ears, the tassels, and sometimes in the leaves of the corn plant.

The best way to prevent corn smut is by *rotation of crops*. This means to change the location of the crops planted each year. This helps to prevent smut because the spores do not usually live in the soil for more than a year. It also is desirable that all plants that are affected with smut be destroyed in order to prevent the transfer of the infection.

The *oat smuts*, *stinking smut* of wheat, and the *covered smut* of barley are three common smuts which are dangerous to cereal crops. The spores of these smuts are dusted on the outside of the seeds when the crop is threshed. Threshing means the separation of the seed from the straw. When seeds carrying smut spores are sown, the spores sprout and infect the young seedlings. The spores can be destroyed by treating the seeds with a



Hugh Spencer; U.S.D.A.

**Corn Smut (Left); Wheat Stinking Smut**

disinfecting solution, such as *copper sulfate* or *formalin*. Certain mercury dusts also are used to destroy smut spores on the surface of seeds.

Although most of the best-known smuts cause serious damage to agricultural crops, there are a few kinds of smuts that make certain plants edible. Some of the smuts can be grown in culture in the laboratory in much the same way as yeast cultures.

W.F.H.

**SMUTS, JAN CHRISTIAAN** (1870- ), is a South African soldier and statesman. He fought with the Boers against Great Britain in the South African War, but later became one of the British Commonwealth's most trusted leaders as Prime Minister of South Africa.

Smuts was born at Cape Town, a member of an old Dutch family. He studied law at Cambridge University, where he learned to respect and admire the British people. Smuts returned to Cape Town and began to practice law there. He began his political career as a follower of the British empire-builder, Cecil Rhodes, and spoke in favor of uniting the Boer republics with Great Britain. But Smuts learned that Cecil Rhodes was one of the plotters of the Jameson Raid which tried to seize the Transvaal Republic by force, and Smuts turned against him. (See JAMESON, LEANDER, SIR.) The young Boer went back to his own people and became a prominent lawyer in the Transvaal.



Jan Smuts, gifted statesman of the Union of South Africa

Smuts attracted the attention of President Paul Kruger, and before he was thirty years old he was appointed state attorney. When war broke out with Great Britain in 1898, Smuts was given a command and proved to be as great a soldier as he had been a lawyer. As a leader of guerrilla troops, he rose to the rank of general. After the war he and Louis Botha set about the task of binding up their country's wounds and bringing back prosperity. In 1906 Great Britain gave the Transvaal self-rule, and Smuts' admiration for the British returned. He worked hard for the union of the South African colonies, and when the Union of South Africa was formed in 1910 he was appointed Minister of the Interior, Mines, and Defense.

When World War I broke out four years later, Smuts organized the military forces of the Union. Many Boers still hated the British and saw the war as an opportunity to break away from the Empire. But Smuts and Botha suppressed all ideas of withdrawal and secured popular support of the war effort. They then turned their attention to fighting the war and captured German Southwest Africa. Smuts was appointed commander of the imperial forces in South Africa and undertook the conquest of German East Africa.

Prime Minister David Lloyd George recognized Smuts' abilities and called him to London as a member of his War Cabinet. After the war Smuts played a leading part in the founding of the League of Nations. He fought against the harsh terms of the Versailles Treaty, but signed it when Great Britain did. Smuts then returned home, and upon Botha's death, became Prime Minister of the Union of South Africa.

But there was still unrest in South Africa, and as the years went by the cry for independent statehood grew louder. Smuts continued to favor union with Great Britain and in 1924 he and his party were defeated. The Nationalist Party of James Hertzog ruled South Africa until the outbreak of World War II in 1939. At that time the Assembly overthrew Hertzog's pro-Nazi government and voted to declare war on Germany. Smuts became Prime Minister for the second time. In 1941 he was raised to the rank of Field Marshal and later was

took an active part in the establishment of the United Nations. See also BOTHA, LOUIS.

E.M.E.

**SMYRNA**, *SMUR* *nah* (population 200,000), is a Turkish port and trading center on the eastern coast of the Aegean Sea. Its Turkish name is Izmir. The city lies about 200 miles southwest of Istanbul, and the two cities are connected by a railroad. Smyrna is built on the slopes of Mount Pagus and the plains below. The surrounding vilayet, or district, also is called Smyrna.

Turkey and Greece have long quarreled over the ownership of Smyrna. It was a Greek colony for many hundreds of years before Christ. Many persons believe Smyrna was the birthplace of the Greek poet Homer.

For a long time, Smyrna was the center of a thriving Oriental rug trade. But the struggles after World War I reduced the city's wealth and population. Italy, as well as Turkey and Greece, laid claim to Smyrna. The Allied Peace Conference finally granted Greece temporary occupation rights. Greek troops landed in Smyrna in May, 1919, and Turkish inhabitants of the city began to suffer from Greek oppression.

In August, 1920, the Treaty of Sèvres gave the Smyrna area to Greece for two years. The new boundary lines cut across natural frontiers, and broke up the geographic and economic unity of the region. Conflicts arose between Turks and Greeks. Turks began to enter Smyrna, and many Greeks left the disputed city.

When Turkish troops occupied Smyrna in September, 1922, a great fire broke out, more than half the city was destroyed, and thousands of persons lost their lives and property. The Lausanne Conference of 1923 gave Smyrna back to Turkey.

Under the Turkish President Kemal Atatürk, the carpet and textile industry in Smyrna again began to grow. Cotton gins and flour mills were built throughout the city. Today Smyrna is a great Turkish port and railroad center. Airports have been built in the surrounding vilayet.

B.W.W.

See also GREECE (History and Government, Postwar Period); KEMAL ATATÜRK; LAUSANNE, TREATY OF; SÈVRES, TREATY OF; VENIZELOS.

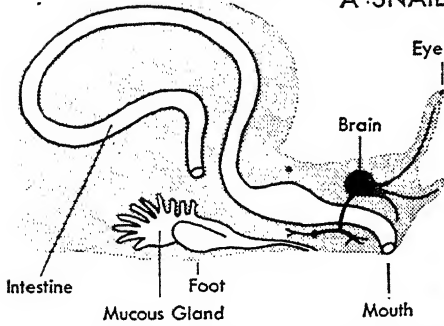
**SMYTH**, *smeyeth*, **ETHEL MARY, DAME** (1858-1944), was an English composer and author. She was also a leader in the movement to secure for women the right to vote. She was born in London, and studied music in Leipzig. Three of her successful operas are *The Forest*, *The Wreckers*, and *The Boatswain's Mate*. The overture of *The Boatswain's Mate* is "March of the Women," which became the battle song of the suffragist movement. Her literary works are autobiographies, *Impressions That Remained*, *Streaks of Life*, and *As Time Went On*.

K.L.B.

**SNAIL**, *snayl*. Snails are mollusks that generally possess shells. When present, the shells are usually coiled and are always in one piece. The *periwinkle* is a common snail along the Atlantic Coast.

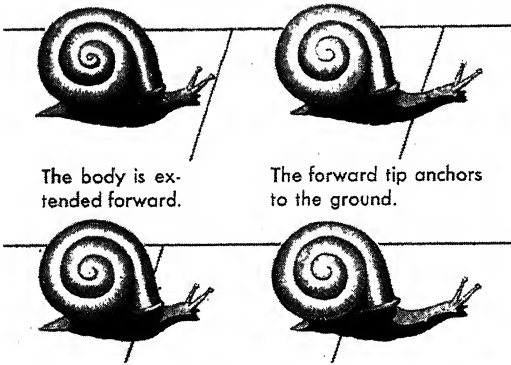
Some snails live on land, some in fresh water, and others in salt water. Most land snails make their homes on or near the ground in damp places under logs or stones, on the edges of ponds and streams and in damp woods. Some, however, are known as tree snails for they live well up in the trees on the branches and leaves.

# ANATOMY OF A SNAIL



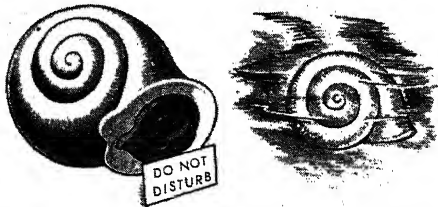
and snails are most active at night and after a rain.  
Fresh-water snails live in most of our rivers and ponds

## THE SNAIL WALKS SLOWLY



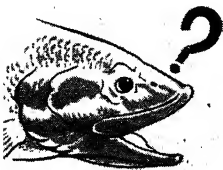
The shell is drawn forward and the process is repeated.

## BUT PROTECTS ITSELF WELL BY—



Drawing its body into the shell and closing the entrance with its tough, flexible "foot."

Giving off a dark fluid that forms a "smoke screen" which completely hides it when enemies threaten.



**The Collector Snail** goes even further and attaches other shells and sand to its shell as camouflage.



Ralph Buchsbaum

## The Tree Snail's Shell Has Barber-Pole Stripes

and are found usually on aquatic plants. Marine snails live on rocks, sand, and mud from the high-tide line down to very great depths in the ocean. w.j.c.

See also **ANIMAL** (color plate, Leading Groups in the Animal Kingdom); **PERIWINKLE**; **SHELL** (color plates); **SLUG**.



L. W. Brownell

**The Foot of the White-lipped Snail** shows plainly, as the little mollusk crawls forward slowly on the branch of a bush.

**SNAKE.** Many persons fear snakes. But this fact only makes snakes more interesting to persons who have either never had this fear or who have overcome it. Certainly the dread of these reptiles is not born with us. A young child often looks at a snake with interest rather than with alarm.

The snakes are the best-known legless reptiles. They form a large division of reptiles, rivaled in size only by the lizards. Their other relatives are the turtles, tortoises, alligators, crocodiles, and the tuatara.

More snakes live in the tropics than anywhere else, and that is where the largest ones are. The giant anaconda of South America and the reticulate python of Asia may grow to be thirty feet long. But there are very small snakes, not over five inches long, and others of various sizes. There are no snakes in New Zealand, the Azores, or Eire, and there are few on most remote islands in the ocean.

**Poisonous Snakes.** In most cases there is little reason to fear snakes. About 2,400 kinds of snakes are known today, but only about eight out of a hundred are dangerous to man. Many places are entirely free of poisonous snakes. Often it is easy to tell the deadly kinds from the harmless ones, and some snakes are helpful. They kill many rats, mice, and other rodents that destroy crops. It has been estimated that one snake will eat nearly 150 mice in six months. These facts make it foolish to destroy snakes without reason.

The United States is a good example of a large area where it is easy to recognize the poisonous snakes. Here, every poisonous snake is either a pit viper or a coral snake. Pit vipers have a deep hollow, or pit, in front of each eye, and below it, on the side of the head. Rattlesnakes are pit vipers and are easy to know by their rattles. The only other pit vipers are the water moccasin and the copperhead.

Coral snakes have bright bands of red, yellow, and black. They live in the plains of the southeast near sea level, and in low places of southern Arizona. Some

harmless snakes look much like coral snakes. Two facts will help to identify them. In coral snakes, the snout is black and the bands of color extend right across the belly. In nearly all other snakes, the belly is not colored like the back.

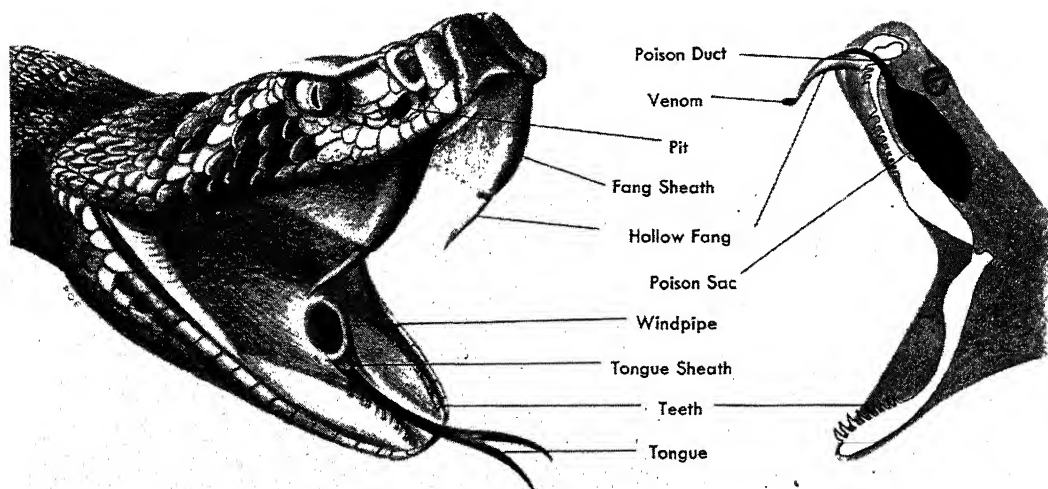
**Appearance and Habits.** Many persons group snakes, earthworms, and eels together in their minds. About the only things these animals have in common are their shape and cold-bloodedness. The snake is not slimy like the worm and eel, but dry and smooth. It is covered with scales, which are folds in the skin. Its ears cannot be seen from the outside, and the snake is deaf to sound carried by air. A snake's eyes are protected by a transparent cap that is shed with the skin. The snake sleeps with its eyes open. Its tongue is long, slender, and forked. A snake keeps flicking out its tongue as it moves, for it is the animal's organ of touch.

The snake has a backbone, like the eel. The snake's backbone is a very long chain of as many as 300 small bones, or vertebrae. A man has only 33 or 34 vertebrae. With this long string of bones, the snake can crawl, climb, and swim with great speed, even though it has no legs. The snake can bend easily because it has so many joints, rather than because the bones are joined together loosely.

A person can tell the number of vertebrae in a snake's body if he counts the narrow scales across the belly. There is about one scale for each vertebra, with its pair of ribs.

It is hard for a snake to crawl on a smooth, flat surface. Each curve of its body must have something on the ground to push against. When the curves push all at the right time, the snake can crawl with a rapid and beautiful motion. When it moves, it does not raise part of its body off the ground, but only bends it from side to side.

Snakes are cold-blooded, like all other animals except mammals and birds. This is the reason they feel cool to the touch. A man's body is always warm, but a



CHARACTERISTICS OF A PIT VIPER (RATTLESNAKE)



snake's body is always about the same temperature as its surroundings. A snake taking a sun bath feels warm because its body takes up the heat, as a bar of iron does. Too much sun quickly kills a snake. When its temperature gets a little above 100° F., it becomes extremely uncomfortable, just as a man does. Snakes and men can stand about the same degree of fever. But a snake can stand much greater chill. It does not die until its temperature goes below the freezing point.

Snakes thrive in the tropics, like other animals that can not control their own temperature. They have great trouble avoiding the severe cold of winter, and there are almost no snakes in the Arctic regions. In temperate zones, they pass the winter deep in the ground, or in some other place where it is warm enough. This way of spending the winter is called hibernation. The dense foliage of the tropics usually gives them enough protection from the sun. Very dry spells in some regions give the snakes too much heat. Then they hide themselves the way snakes of the temperate zones do in the winter. A snake hibernates in winter, and when necessary, estivates in summer.

It is not unusual to find almost perfect snakeskins in rocky or bushy places. Snakes grow a complete new skin several times a year. They slip out of the old one, turning it inside out, and leave it behind like a hollow tube. This process is called *molting*.

Nothing is more astonishing about a snake than its habits of feeding. It must swallow its food whole because its teeth are sharp like needles, and not good for chewing. They are curved toward the throat to give a better grip, and help make up for the lack of legs. The bones of a snake's lower jaw are loosely connected to

each other and to the skull. The snake can separate them and swallow an animal two or three times as thick as its head. Its powerful stomach juices then digest all the animal except feathers and hairs.

A healthy snake can do without food for a year or more. But snakes usually eat regularly and often, storing up extra food as fat. Since the snake can swallow large objects, it can eat many different kinds of animals. The big pythons sometimes eat mammals weighing more than 150 pounds. But animals with long bodies are the easiest to swallow. Lizards and other snakes are favorite foods of snakes. This does not mean that snakes eat their own kind.

Zoologists tell us that different kinds of snakes are not closer relatives than men and the cows they eat. Some of the tropical snakes that are as small as worms, eat tiny insects with soft bodies, and other small creatures.

Most snakes hatch from eggs, but others are born alive, like mammals. In either case, the young snakes can take care of themselves. They can live without food for months if they have to. The number of young in a brood is different for different kinds of snakes. Some kinds have only a few at a time, whereas many others have dozens and a few even have scores.

The kinds of snakes that have been studied all grow quickly. They are full-grown in about two or three years. We do not know just how long a snake lives. Some snakes have lived about twenty-five years. C.H.Po.

**Related Subjects.** The reader is also referred to:  
 Animal (color plate,      Circus (color plate, Snake  
 Leading Groups in the      Tamer Side Show)  
 Animal Kingdom      Fang  
 [Scarlet Snake])      Snake Charming  
 Brazil (Butanta Institute)

#### KINDS OF SNAKES

Adder	Fer-de-Lance
Anaconda	Garter Snake
Asp	King Snake
Blacksnake	Mamba
Boa Constrictor	Milk Snake
Bushmaster	Python
Cobra	Rattlesnake
Copperhead	Viper
Coral Snake	Water Moccasin
Cottonmouth	

**Classification.** Snakes belong to the class *Reptilia*. Many scientists group them together with the lizards, in the order *Squamata*, and call them the suborder *Serpentes* (formerly *Ophidia*).

**SNAKEBIRD.** SEC DARTER; WRYNECK.

**SNAKE BITE.** The fangs of a rattlesnake or copperhead snake are like hollow hypodermic needles, which carry the poison into the victim's body. The poisonous bite can be recognized by one or more punctures caused by the fangs. The poison quickly causes severe stinging. Soon the area around the bite begins to swell and turn purple. The victim may then become pale, weak, and sick at the stomach. His pulse becomes weak and rapid.

The coral snake leaves a different bite. It does not strike, but hangs on and chews. There is little pain at first, but later the breathing organs are partly paralyzed, and the patient becomes sleepy.

If the snake is not poisonous it leaves only a group of surface bites, sometimes shaped like a horseshoe.

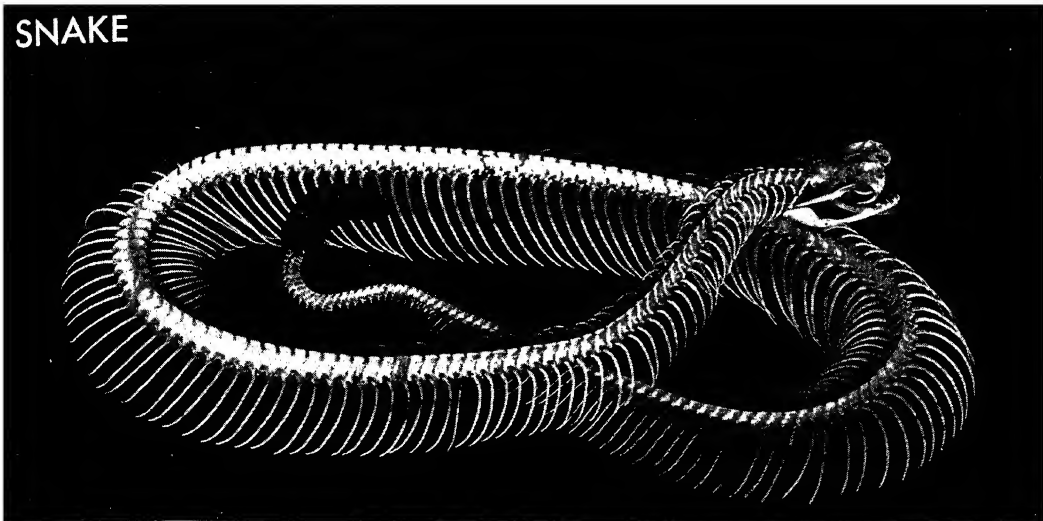
If possible, the first thing to do in case of snake bite is to call a doctor. If the doctor's office or a hospital is



Hugh Davis

**A Rattlesnake Is "Milked"** to obtain the venom from its poison sacs. The fangs are forced through the cover of the glass vessel and venom is squeezed out. From it an antivenom is made for the treatment of rattlesnake bites.

# SNAKE



**This Skeleton of a Rattlesnake** shows the many sets of slender ribs which are attached to the reptile's long and flex-

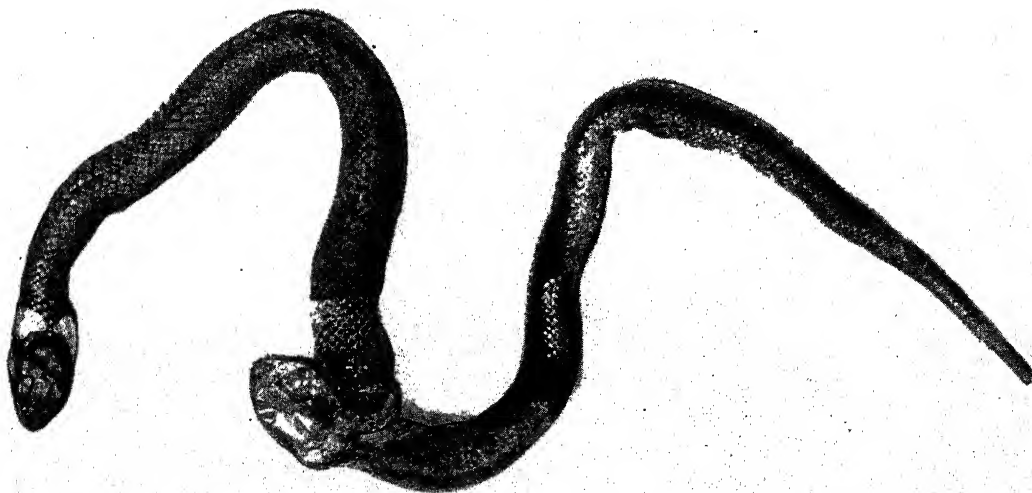
ible backbone. The curved needlelike fangs through which venom is ejected show plainly in the skull.



**The Common Garter Snake** gives birth to live young. This is a female with its dozens of wormlike baby snakes.



**Baby Milk Snakes** crawl over the collapsed shells of eggs from which they have just hatched. Some eggs are still unhatched.



Photos: General Biological Supply House; American Museum of Natural History; Lynwood M. Chace; Leonhardt; Black Star

**It Might Be a Two-Headed Snake, but It Isn't.** The snake is shedding its skin, or molting. The "head" in the middle of

the body is merely the empty head covering of the old skin. The entire skin is discarded in this manner.

near, the patient should be driven there. He should not walk, as activity spreads the poison. Have the patient lie down and remain quiet.

If there is no doctor near, use first aid. A snake bite outfit or first-aid kit may contain antivenom serum. This is the best remedy. Even with the serum, the following measures are also necessary:

1. Apply a tight bandage above the wound. Loosen it every twenty minutes, then tighten it again. Move the bandage higher if the swelling spreads.
2. Cut open the fang marks with a sterilized knife or razor blade. A flame will sterilize the knife, and the wound should be painted with iodine or alcohol. An X-shaped cut should be made through each fang mark.
3. Apply suction to the cuts to remove the poison. Many first-aid kits include a suction or bulb syringe. If there is none, suck the wound by mouth, and spit out the poison. Be sure you have no open sores in your mouth. A hot bottle or glass with its mouth tight over the wound will also create a suction as it cools. The suction may be needed about fifteen minutes in each hour for several hours. Between these periods, cover the wound with hot Epsom-salt or table-salt compresses.
4. If the poison spreads before the doctor comes, the bandage should be moved higher, and other cuts may be made where the swelling is bad.
5. Epsom salts and plenty of water may be taken by mouth. Whisky should *not* be given, but in case of collapse, the patient may take strong, hot coffee or aromatic spirits of ammonia ( $\frac{1}{2}$  teaspoon in cold water every half hour).

**SNAKE CHARMING** is an ancient form of entertainment in India, Egypt, and the Near East. The art is mentioned in the Old Testament and by many ancient writers.

Snake charmers usually sit before the snake and play



Williams, Pic

**Indian Snake Charmer at Work.** As the charmer plays weird music on his flutelike pipe, the cobra rises slowly and waves to and fro, keeping time with the movements of the snake charmer's body.

a flutelike instrument. The animal then slowly rises into the air. Sometimes charmers cut out the fangs of poisonous snakes to make them harmless, but often the fangs are left in. Snake charming as practiced in the Old World is not so remarkable as people believe. Snakes have no external ears or eardrums, and can not hear sound waves in the air. The snake charmer's music has nothing to do with charming the snakes. They would behave exactly the same if he did not play his flute. But the charmer sways while playing, and the snake follows his movements to stay in front of him. A snake charmer must thoroughly understand the habits of his snakes. These snakes are usually cobras.

Circuses in the United States often have "snake charmers" who merely hold up large boas or pythons. There is almost no risk to these acts, for the large snakes are harmless. If they are treated gently they become entirely used to being handled.

C.H.Po.

See also ASP; COBRA.

**SNAKE DANCE** is a strange ceremonial dance of the Hopi Indians of Arizona. The dancers are members of the Antelope and Snake priesthoods of the tribe. They carry live snakes in their mouths as they dance. The snakes are usually rattlesnakes, but the dancers handle them so carefully that they are hardly ever bitten.

The purpose of the snake dance is to beg nature for rain to water the dry lands of Arizona. After the dance, the whole Indian village has a great feast. The snake dance is held every two years, in August.

W.D.H.

**SNAKE KILLER.** See ROAD RUNNER.

**SNAKE RIVER.** The Snake is the largest branch of the Columbia River. Its waters are used for irrigation purposes and to furnish water power. The river rises high in the Rocky Mountains of Yellowstone Park, then flows in a southwesterly direction to the southern part of Idaho. Here the river turns westward, flows across Idaho to the Oregon boundary, and then swings sharply northward. The Snake River forms 170 miles of the boundary between Idaho and Oregon. It flows for about thirty miles between Washington and Idaho. Near Lewiston, Ida., and Clarkston, Wash., the river turns westward into Washington, where it joins the Columbia River near Pasco. The Snake River is over 900 miles long, but its many falls and rapids make it useless for water traffic except for 100 miles of its course between its mouth and Lewiston, and for local portions farther upstream. The Indians called the river Shoshone, which is the name now given to a waterfall at the Idaho-Wyoming boundary.

The Snake River furnishes irrigation water as it flows across southern Idaho, a region which is famous for its potatoes. Along the Oregon-Idaho border, the river flows through the Snake River Canyon, one of the deepest in North America. At one point, Snake River Canyon is nearly as deep as the Grand Canyon.

L.D., Jr.

**SNAKEROOT** is the name given to a large number of plants whose roots look like snakes. It was once believed that these roots could cure snake bites. The plants grow throughout the United States and in many parts of Canada. Some kinds of snakeroot do have medicinal value. *Black snakeroot*, or *cohosh*, yields a drug used to treat St. Vitus's Dance. The roots of *Virginia snakeroot*, or *birthwort*, have tonic properties. Another species,



N.Y. Botanical Garden

Blossoms and Leaves of White Snakeroot

*Canada snakeroot*, or *wild ginger*, has stimulating qualities, and is used as a spice. An emetic is prepared from *Senega snakeroot*. H.N.M.

**Classification.** Black snakeroot is *Cimicifuga racemosa* in the *Ranunculaceae* family. Virginia snakeroot is *Aristolochia serpentaria*, and Canada snakeroot is *Asarum canadense*. Both are in the *Aristolochiaceae* family. Senega snakeroot is *Polygala senega* in the *Polygalaceae* family.

**SNAP BEAN.** See BEAN (Kinds of Beans).

**SNAPDRAGON** is the name of a group of plants which have blossoms that fly shut with a snap when they are pressed open and then released. The most common species is a native of Europe and is growing in



Ferry-Morse Seed Co.

The Snapdragon Is a Favorite Flower with Children, who enjoy snapping the blossoms open by gentle pressure.

many gardens today. It is used for ornamental borders for large flower beds.

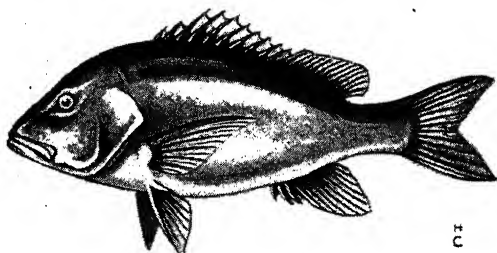
Each flower of the snapdragon consists of a tube with two closed lips at the end. The velvety texture and beautiful, varied colors of the snapdragon give the blossoms great charm. The stalks grow three feet high or more, but there are also dwarf varieties. They are covered with short, fine hairs, and with small, smooth leaves, which are somewhat thickened.

The common snapdragon must be grown from seeds each spring, although it may live through the winter. The best varieties are those which can resist rust. A.C.H.O.

See, also FLOWER (Planting Table for Annual Flowers).

**Classification.** Snapdragons are a genus belonging to the *Scrophulariaceae* family. The common snapdragon is *Antirrhinum majus*.

**SNAPPER.** The snapper is one of the important food fishes of southern waters. It lives in both the Pacific and Atlantic. The snappers of the Western Hemisphere are most common around Florida, the West Indies and the shores of the Gulf of Mexico, and the Caribbean region. In the Pacific, they are most common around the tropical coral atolls and the East Indies and



The Red Snapper is one of the most important food fish caught off the Florida coast. Several million pounds of red snapper are caught annually and landed at Pensacola, Fla. This red-colored fish is easily boned for cooking.

Philippines. They live rather close to shore, usually in rocky places, but some red snappers swim in moderately deep water.

The snapper grows as long as two or three feet. It has a high, almost humped back, and is rather flat from side to side. The mouth is very large with strong teeth. Its tail is slightly forked. Snappers may be red, greenish, or striped. They often have a black spot on each side. Snappers are a very popular food fish and are often served baked. L.P.Sc.

**Classification.** Snappers make up the genus *Lutjanus* in the family *Lutjanidae*. The popular red snapper is *Lutjanus campechanus*.

**SNAPPING TURTLE.** See TURTLE.

**SNARE DRUM.** See DRUM.

**SNEDEKER, CAROLINE DALE** (1871- ), is an American author of books for young people. She is probably best known for her stories about ancient Greece. She was born in New Harmony, Ind., where her great-grandfather, Robert Owen, had established a socialistic colony. (See NEW HARMONY; OWEN, ROBERT.) In 1904 she moved to Hempstead, Long Island, N.Y., the background for her book *Black Arrow-head*. B.F.



High-speed Photographs of a Sneeze show how the thousands of tiny droplets are violently ejected from the nose and mouth. The little particles of moisture travel as fast as

Her Works include *Seth Way*, a novel with New Harmony for its setting; *The Perilous Seat*; *Theras and His Town*; *The Spartans*; *Downright Dency*; and *The Beckoning Road*.

**SNEEZEWORD** is a hardy plant belonging to the sunflower family. It grows in Europe, Asia, and North America. The sneezewort is a *perennial*. Its roots send up stems and flowers each year without being replanted. The plant gets its name from its strong odor which causes sneezing in some people. The plant is about two feet in height. It has small white flowers and leaves that are finely toothed.

P.C.S.

**Classification.** The sneezewort belongs to the family *Compositae*. Its botanical name is *Achillea ptarmica*.

**SNEEZING** is a sudden and violent rush of air out through the nose. Unlike the act of blowing the nose hard, a sneeze is involuntary. It is caused by irritation of the sensory nerves of the nose, and is a spontaneous effort of the body to remove the cause of irritation.

A common cold in the head usually makes the patient sneeze from time to time. Hay fever, asthma, and whooping cough cause continued and violent fits of sneezing. Nasal catarrh often causes an attack of sneezing. Dust, pollen, tobacco smoke, and other irritants may cause sneezing. Persons with severe attacks often help their condition somewhat by applying menthol or a similar drug to the inner passages of the nose. Drugs that shrink the membranes which line the nose may also be helpful.

Everyone should be careful to sneeze into a handkerchief. The little droplets of moisture which are emitted with the sneeze carry germs which cause colds, influenza, and similar diseases. A single sneeze may scatter many thousands of bacteria-covered droplets.

P.R.C.

**SNIPE** is the name of a group of shore birds related to the sandpipers, curlews, and plovers. The *Wilson's snipe* is about eleven inches long, and has a short tail and a very long bill. A flexible, sensitive tip on the bill is used in poking about for worms and grubs. This bird performs acrobatics in the air during the mating season. It also has a strange habit of "bleating" or "drumming." This sound is produced when the bird flies to a great height and then descends in one quick swoop after another, with the air rushing through its feathers.

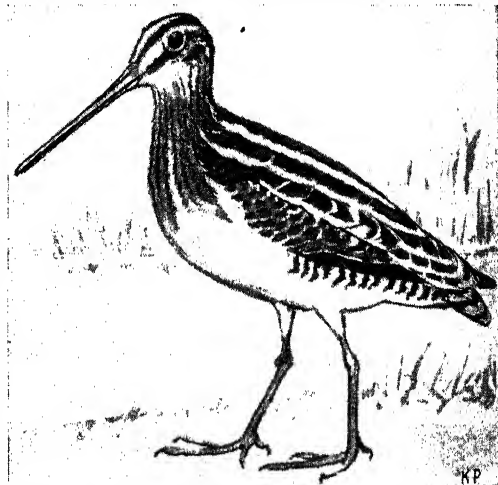
150 feet a second and as far as 12 feet. They carry germs which spread colds and similar diseases. The germs may live in the air for days after the drops evaporate.

Possibly both wing and tail feathers aid in making the sound. In the summer Wilson's snipe is found from the northern United States to Hudson Bay and Labrador, and it winters from Illinois and South Carolina southward. The snipe is more timid than the sandpiper about being seen in the open by day. Its nest is a low place in the ground on the edge of marshes. The female snipe lays four eggs, colored olive brown or grayish drab, and thickly spotted with chocolate. See also **AVOCET**; **BIRD** (Colors of Birds); **CURLEW**.

A.M.B.A.

**Classification.** Snipes belong to the family *Scolopacidae*. The Wilson's snipe is *Capella delicata*; the European snipe is *C. gallinago*.

**SNOOPERSCOPE.** This electronic device makes it possible for an observer to sight objects in darkness. The instrument uses an infrared light beam and an electronically operated telescopic sight which together make an invisible object form a clear and vivid image. All objects sighted through the snooperscope take on a greenish hue. The snooperscope is mounted on a hand



**Wilson's Snipe** is called the jacksnipe by sportsmen. Because it lives in muddy meadows and bogs, and is a fast flier, it is a very difficult bird to shoot.

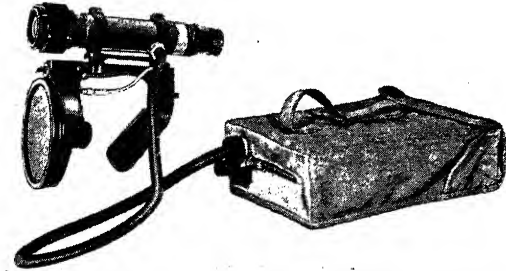


grip. Power is received from a small electric battery pack strapped to the user's back.

Among the uses found for the snooperscope during World War II were the direction of gunfire and signaling in darkness. It also proved effective in running locomotives and other vehicles at night.

**The Sniperscope** is a snooperscope mounted on a .30-caliber carbine. This device consists of a telescope placed above the rear sight and the infrared source, which is attached below the barrel. The infrared source looks like a fog light with a glass face which appears to be painted black.

The snooperscope and the sniperscope were responsible for 30 per cent of the Japanese casualties during



Electronic Laboratories

**The Snooperscope** is used for night observation and signaling. The battery pack supplies power, and the round bottom light sends out an infrared beam, invisible to the naked eye. The telescope sight is especially built to pick up the infrared beam. This device is also attached to rifles.

the first seven days of the battle for Okinawa in World War II.

R. COL.

**SNORING**, *SNOHR ing*, is a rough, guttural sound people often make when they sleep. The sound may vary from heavy breathing to loud noises which sound like the word "snoring" itself. The sounds come from vibrations of the relaxed soft palate and uvula in the back of the mouth. The passage of air when we breathe causes these parts to vibrate. When the sleeping person's mouth falls open, the soft palate and uvula become dried out, and the snoring grows worse. The snorer may awaken to find himself with a sore throat.

Snoring can be produced or made worse by inflammations or obstructions in the nose, such as adenoids, growths, a broken nose which has not been set properly, or a bent nasal septum, which is the partition that separates the nostrils. All these obstructions and irritations require treatment to be corrected.

Snoring is often made worse by great fatigue, deep sleep, sleeping on the back, or throwing back the head. Antisnoring devices have been used, such as bandages under the chin and mechanical devices which waken the sleeper when he rolls on his back. But these have not had great success.

P. R. C.

**SNORRI STURLUSON**, *SNAHR ree STOOR loo sohn* (1178?-1241), was one of the earliest historians of Iceland. He wrote the famous *Prose Edda* (see *EDDA*) and a series of biographies of old Norwegian kings entitled *Heimskringla*. The *Prose Edda*, one of the first masterpieces of Scandinavian literature, was completed in 1222, but was not published until the 1600's. Snorri Sturluson

was prominent as a poet, lawyer, and statesman. In 1215 he was made president of the legislative assembly and high court of Iceland. Three years later King Haakon invited him to visit Norway. When he returned home he became a vassal of the Norwegian king and negotiated a peace treaty between Iceland and Norway. After many years, Haakon lost confidence in him and ordered him killed.

P. M. B., JR.

**SNOUT BEETLE**. See **BEETLE** (Kinds of Beetles); **BOIL**. **WEEVIL**.

**SNOW**. Almost everyone in the colder parts of the world knows the shimmering ice crystals called snow. Snow is formed when the water vapor in clouds is turned into moisture at a temperature below freezing (32° F.). If the temperature is above freezing, rain falls instead of snow. Snow does not always reach the earth in its original form. Sometimes the ice crystals are partly melted, and reach the ground as sleet. Sometimes they are entirely melted and fall as rain.

Snow forms crystals which always have six rays, but the designs are always different. No two snowflakes have ever been found to be exactly alike. Large snowflakes are combinations of these crystal fragments, and have been known to measure four inches in diameter. The elaborate designs in snowflakes may be seen by collecting some flakes on a black surface and examining them under an ordinary magnifying glass.

The white color of most snow is due to the reflection of light by the tiny surfaces of the crystals. Red snow and green snow have been known to fall in Greenland and a few other arctic regions. This snow is colored by tiny living things in the snow. Snow is often colored black by dust particles.

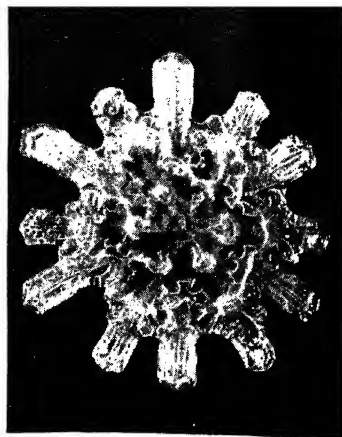
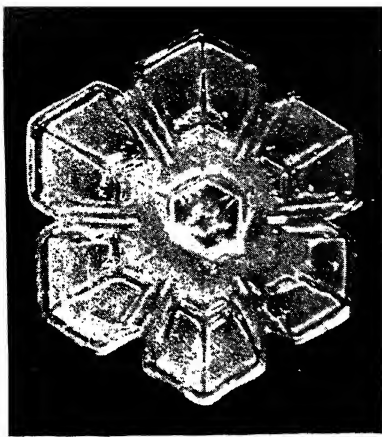
There are millions of persons in the world who have not seen snow, since it never falls on more than a third of the earth's surface. There are parts of the southern United States where snow has never fallen.

Snow falls in all seasons in the polar regions. In the Temperate Zone, snow falls only during the winter. The heaviest snowfalls occur in the mountains of the Temperate Zone, such as the Rocky Mountains, the Sierra Nevada range in California, and the Alps in Italy and Switzerland. These heavy snowfalls have always been dangerous to travelers. In Europe, houses of refuge provide emergency shelter for persons caught in snowstorms. Railroads are often blocked by snowslides in the western mountains of the United States, and motor roads are sometimes closed to traffic for days. Powerful snowplows are used to clear the snow from the roads and tracks.

Mountain snow is important because when it melts it provides water for streams, electric power plants, and irrigation reservoirs. But the amount of water in snow is much less than in rain. It takes a snowfall of about ten inches to equal a rainfall of one inch.

In 1946 a research scientist, Vincent J. Schaefer of Schenectady, N.Y., created the first artificial snowflakes. Schaefer produced these flakes in a "cold box" into which he breathed. The moist air of his breath condensed into snow clouds, which he changed into snow by introducing an extremely cold rod into the "cold box." Later, Schaefer actually caused snow to fall in nature by using dry ice.

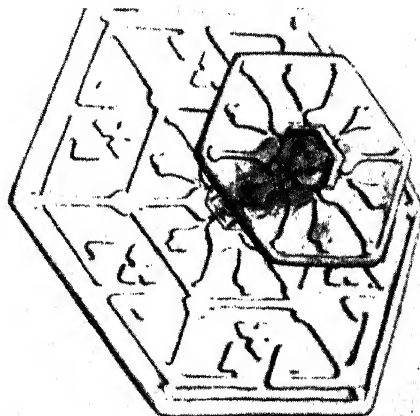
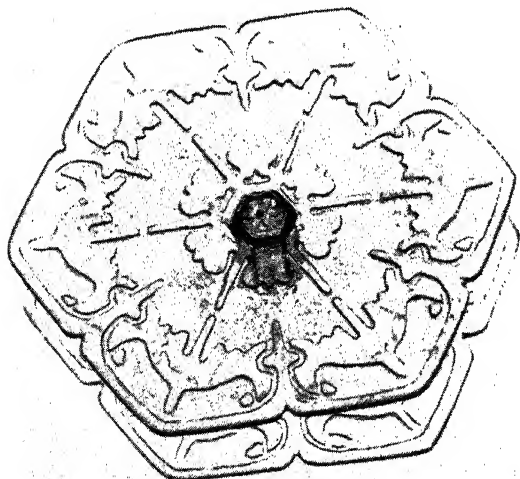
E. S. S.



Photomicrographs by Vincent J. Schaefer

**These Types of Snowflakes** are shown in "casts." The flake falls into a plastic solution which coats the snowflake and hardens

quickly. As the flake melts, it leaves a hollow shell, or cast, which retains the exact shape of the flake.



**Two Models of the Rare Stud Snowflake.** There are two hexagonal plates, one above the other, attached by a hex-

agonal column. These flakes are travelers from a great height and are formed only in very cold temperatures.

**Related Subjects.** The reader is also referred to:  
 Avalanche Snow Blindness  
 Glacier Snow Line  
 Hail Snowplow  
 Sleet Snowshoe

**SNOWBALL**, or **GUELDER-ROSE**, *GEL der-rohz*, is a handsome shrub of the honeysuckle family which pro-



J. Horace McFarland

**The Attractive White Flowers of the Snowball** make the plant a favorite ornamental shrub with home gardeners. duces large, ball-shaped white flowers. The name *guelder-rose* comes from the Dutch province of Guelderland, where the plant is believed to have originated. The snowball is often grown in parks and lawns of the United States today. It is a cultivated form of high-bush cranberry, and grows from seven to twelve feet high. The flowers of the cultivated species do not produce fruit, but a wild guelder-rose bears juicy, red berries. It is also called *European cranberry bush*. J.J.L.

**Classification.** The snowball is classed as *Viburnum opulus sterile*, in the *Caprifoliaceae* family.

**SNOWBIRD** is another name for the junco. See JUNCO.

**SNOW BLINDNESS** is a temporary blindness that occurs when the eyes are not protected from the glare of the sun on snow. Very large snowy areas reflect a great amount of dazzling light. Persons who must stay out in these areas for long lengths of time should wear dark sun goggles. Eskimos who live in snowy regions have made sun shields of bone that fit in front of the eyes like goggles. A thin slit in the shield shuts out the glare but lets the wearer see through. Sun blindness may cause a person to "see red." The blindness may last for several days of a week before sight returns. P.R.C.

**SNOW BUNTING**, or **SNOWFLAKE**, is a sparrowlike bird of northern North America. It is mostly white on its head and breast, but its back, wings, and tail are partially black. During the fall and winter, the head and back feathers are edged with brown. These edges wear off as the winter passes on. The bird turns black and white before it reaches its nesting ground on the tundra plains in Canada and Alaska.

These birds do not come as far south as the United States except when the snowfall is heavy. But they are the most familiar winter birds in Canada. They spend their summers in the arctic regions. They sing as happily in the winter as other birds do in June. A.A.A.

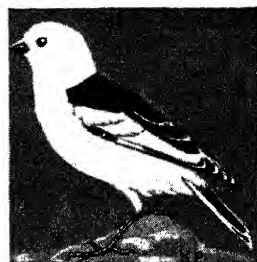
**Classification.** The snow bunting belongs to the family *Fringillidae*. It is classed as *Plectrophenax nivalis*.

**SNOWDEN, PHILIP, VISCOUNT** (1864-1937), was a British statesman and economist. He was one of the early leaders of the Labor party.

**SNOWDON** is the highest mountain in Wales. This peak rises to a height of 3,557 feet above sea level. The mountain is in Carnarvonshire, in northeast Wales. Snowdon's rugged and craggy appearance makes it a fitting background for many Welsh legends. G.B.Cr.

**SNOWDROP** is the name of a plant in the amaryllis family. It gets its name from its many delicate white blossoms which seem to be made out of snow. It grows in many parts of the world. Snowdrops bloom in March or April in northern countries.

The plant grows from a small bulb which produces two or three narrow green leaves and a flower stalk without leaves. The nodding, bell-shaped flowers grow alone, one on top of each stalk. The *common snowdrop* of the gardens is one of the hardiest outdoor plants. It sometimes blooms in midwinter when a sudden warm spell causes the surface of the ground to thaw. In England, the people call the plant the *Fair Maid of February*. Snowdrops are easy to cultivate, for the bulbs can be planted in a sheltered place in early fall and left to



**The Snow Bunting** seems to enjoy winter as much as summer.



J. Horace McFarland

**The Snowdrop, One of the Earliest Heralds of Spring**

themselves. They require very little attention. A.C.H.O.

**Classification.** The common snowdrop is *Galanthus nivalis* in the *Amaryllidaceae* family.

**SNOWFLAKE.** See SNOW.

**SNOWFLAKE** (bird). See SNOW BUNTING.

**SNOW GUM.** See EUCALYPTUS.

**SNOW LEOPARD.** See OUNCE.

**SNOW LINE.** Even in the hottest lands, snow lies on upper mountain slopes throughout the year. The lower edge of these permanent snow fields is called the *snow line*. The location of the snow line depends upon the height of the sun, winds, temperature, and moisture. Sometimes the snow line on the same mountain range may change from year to year. In the tropics, the snow line is about three miles above sea level. The snow line of the Rocky Mountains is about two miles above sea level. In the Alps, the snow line is about a mile and two thirds above sea level. The snow line is less than a half mile above sea level in Greenland. The snow line is at sea level in polar lands. W.E.E.

**SNOW-ON-THE-MOUNTAIN** is a popular garden plant which is grown for its attractive white flowers and white-edged upper leaves. Snow-on-the-mountain is found mostly in the western and midwestern parts of the United States. It is an annual, and must be replanted each year. The plant has a soft stem and may grow to be two feet high. The flowers are small and shaped somewhat like umbrellas. Each flower is enclosed by white parts, known as bracts, that look like petals. See also FLOWER (color plate, Prairie Flowers). A.C.H.O.

**Classification.** Snow-on-the-mountain belongs to the family *Euphorbiaceae*. The species is *Euphorbia marginata*.

**SNOW PLANT.** See FLOWER (Strange and Unusual Flowers; color plate, Unusual Flowers and Plants of North America).

**SNOWPLOW.** The snowplow is used to clear snow from streets, highways, and railroads. Railroads and highways are usually cleared by a rotary snowplow, which consists of a wheel about nine feet around, and a series of knives or scoops. The deepest snowdrifts can be cleared with a rotary plow. Another type of plow, with the center pushing along the railroad track, and with sides curved to pick up the snow and throw it clear of the track, is used when snowdrifts are not deep. Somewhat similar plows, attached to trucks or tractors, are also used for clearing snow from roads and sidewalks. Modern snowplows are so efficient that snowdrifts which would have stopped traffic at one time can now be cut through with little effort. Snowplows are also used to clear snow from the runways of airports. A.B.L.

**SNOWSHOE.** A person wearing snowshoes can walk over deep snow without sinking into it. This is possible because the snowshoes distribute a person's weight over a large area. Most snowshoes are at least three feet long, and from a foot to a foot and a half wide. They are made of a light wooden frame, bent into a long oval. Strings of animal hide are stretched across the frame, making it look much like a tennis racket.

In walking with snowshoes, the wearer moves his feet so that the snowshoes slide along the surface of the snow. An outward motion is given the snowshoes with each step. Experts on snowshoes can walk for hours at the rate of five or six miles an hour, and many can run

on them in a sort of dogtrot at ten miles an hour.

Snowshoes were first used by the North American Indians. Today they are used in regions of deep snow by hunters, trappers, loggers, and farmers. In some parts of Canada there are snowshoe clubs organized for recreation. During World War II, United States troops stationed in arctic regions were equipped with snowshoes as well as skis.

F.M.R.

**SNOWSTORM.** See BLIZZARD.

**SNUFF** is a fine powder made from the stems and leaves of the tobacco plant. The tobacco is first fermented by heat and moisture, and then dried and ground. Snuff is sniffed in through the nostrils, or chewed, or rubbed on the gums. Various mixtures of flavors or scents are added to make the powder pleasant. At one time each person carried a snuffbox and it was considered a matter of etiquette to offer "a pinch of snuff" upon meeting a friend. This practice is still carried on in southern Europe.

The habit of taking snuff is considered harmful. One of its effects is irritation of the nerves of smell and a lessening of the ability to distinguish odors.

**SOAP.** Some historians believe the first soap was made by accident, like so many of man's other important discoveries. One story tells us that tallow from candles burned on a sacrificial hill in ancient Rome became mixed with wood ashes. It then ran down the hill to the banks of the Tiber River, and there formed a clay. The Romans found this clay bank a fine place to wash their clothes. They found that the water there loosened dirt much more easily than at other parts of the river. Before people knew about soap, they cleaned their bodies with olive oil and earth or plant ashes. The Arabs of the desert took baths by rubbing their bodies with sand.

A rough cleaning substance somewhat like soap was developed in France in A.D. 200. Soapmakers appeared in Spain in A.D. 700. The Spaniards made their soap, called *castile*, from olive oil and soda. Such soap was expensive, however, and it was not until the 1800's that a French scientist discovered that soda could be made from common salt. He combined this soda with animal fats and made the first soap that was cheap enough for common people to buy.

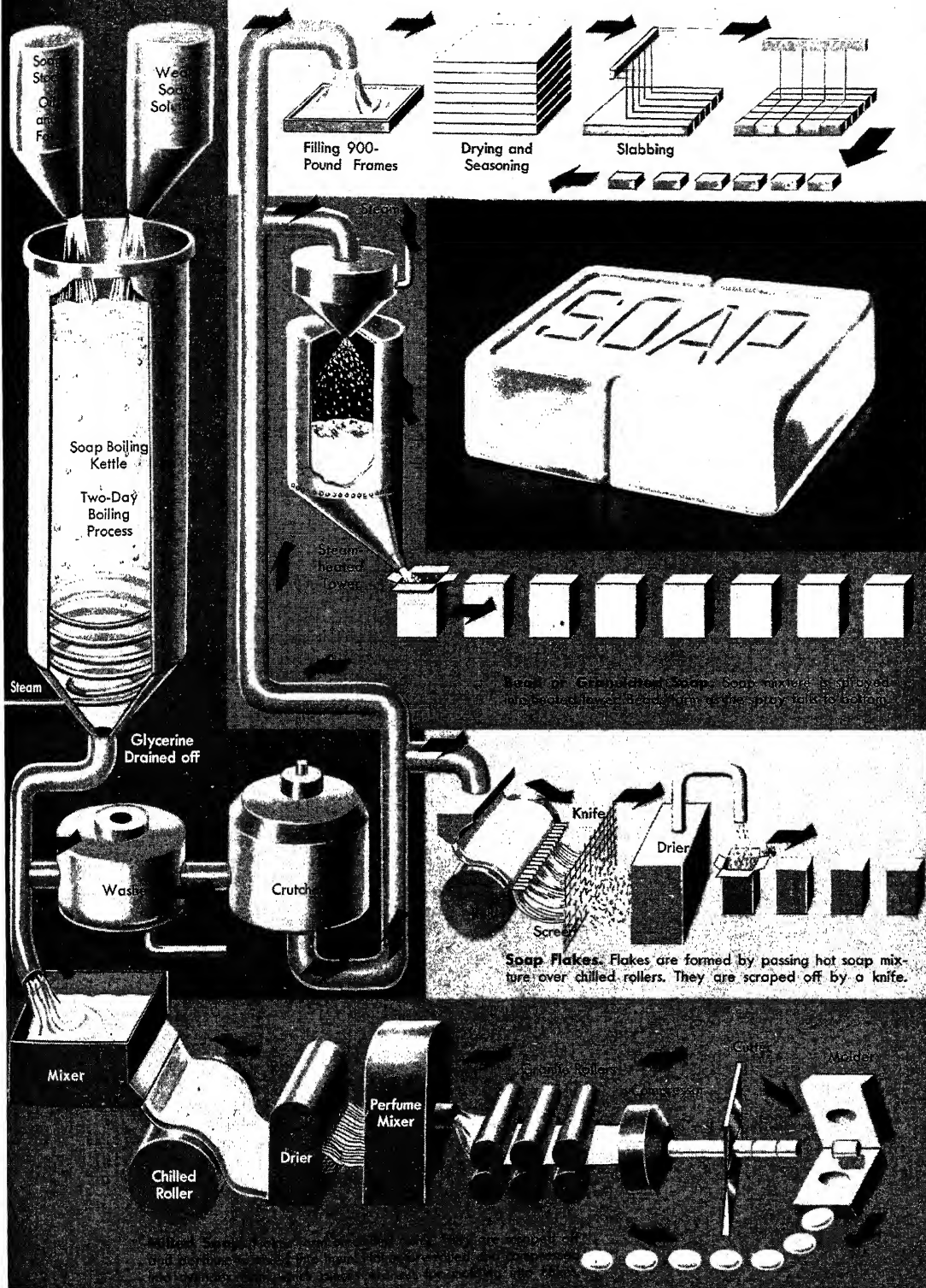
Soapmaking was a home industry in North America during colonial times and in the pioneer days. The housewife boiled tallow or lard and mixed rosin and wood ashes or lye with it to make a crude yellow soap.

### How Soap Works

Soap makes water "wetter." Water does not get through a greasy or dirty surface, but forms a thin, almost elastic covering. This property of water is called surface tension. Soapy water has much less surface tension than clear water. Soap, therefore, helps water to get into the dirt or grease and wash it off. The loosened dirt is held in the soapy water and can be rinsed away. Hot water and soap have less surface tension than cold water and soap, and therefore clean better. Any action such as rubbing or squeezing helps loosen the dirt so that it can be collected in the soapsuds. Soap works better with "soft" water, or water that contains few mineral salts, than with "hard" water, which contains

Finished soaps may differ, but all go through the same basic stages of manufacture. The steps are shown below.

**Cake or Bar Soap.** Soap mixture is poured into frames to dry and season. After removal from frame, soap is cut and molded into cakes.





more mineral salts and thus has more surface tension.

### How Soap Is Made

In the United States enough soap is made every year to provide every person in the country with twenty-five pounds of soap. This includes not only refined and perfumed toilet soaps, but also soaps for household cleaning, for washing dishes, for hair shampoos, and various other cleaning purposes.

All these kinds of soap go through the same first steps in manufacture. The soap stock, which is formed of various fats and oils, is mixed with a solution of soda in giant kettles. These kettles can hold as much as ten carloads of soap. The soap mixture is usually boiled for two days.

The next step in soapmaking is called *graining*. Several tons of salt are dumped into the kettle. The salt carries to the bottom most of the impurities, including glycerine, an important by-product of soap, and undissolved soda.

While the soap mixture is still warm, it is pumped from the kettle to huge mixing machines called *crutchers*. The crutchers beat the soap mixture until it is light and fluffy, and contains many tiny air bubbles.

From the crutchers, the soap mixture goes into large iron boxes called *frames*. The soap is cooled in the frames.

When the soap in the frames has hardened and been trimmed to even edges, rough cakes of soap are cut from the long slabs by machines strung with piano wires. The rough cakes, which look like blocks of white wood, are then stamped to finished shape by machines which also impress designs and the maker's brand name on the cake. These stamping machines can finish as many as 100,000 cakes of soap a day.

**Milled Soap** is made by running the hot liquid soap over water-cooled metal rollers. The dried soap is then scraped off the rollers in long ribbons and chips. Perfumes and coloring matter may then be added. The soap is then pressed into long cylinders by being run through heavy rollers. The stamping press then puts the bars of soap into their finished form.

**Soap Flakes** are made by passing the hot soap mixture over cooling rollers. The dried soap is then scraped off in thin chips, or flakes, and packaged by automatic machinery.

**Bead Soap** is made by spraying the soap mixture into a drying tower so that tiny balls, or beads, of soap are formed. This kind of soap is popular for household uses because the beads dissolve quickly in water.

**Medicated Soap** contains small quantities of antiseptics such as mercuric iodide, carbolic acid, or sulfur.

**Grit Soap** is used for the removal of heavy grease or dirt. It contains rough or abrasive materials such as pumice, tripoli, feldspar, volcanic ash, or fine sand.

**Detergents** are sometimes called "soapless soap." These cleaning agents are usually made in powder form for various household uses. They are not really soaps, but chemical compounds, usually made of hydrocarbons, sulfuric acid, and soda ash (sodium carbonate). Detergents are ideal for laundering fine fabrics and for dishwashing. But soap has been found more efficient than the detergents for the laundering of heavier kinds of soiled material.

G.R.G.

See also PIONEER LIFE (illustration, How Soap Was Made); SOAP SCULPTURE.

**SOAPBERRY**, or **CHINABERRY**, is the name of a group, or genus, of trees and shrubs that bear fruit containing a soapy substance. The soapberry trees and shrubs are grown in tropical regions. But a few species of soapberry are grown in the southern part of the United States as ornamental plants. The fruit of the soapberry is a fleshy or leathery berry. The soapy substance in the berries is called *saponin*. Saponin is used by the natives in the tropics for cleaning purposes. Soapberry plants are reproduced either by seeds or by cuttings in early spring. They grow well in dry sandy soils.

One type of soapberry is an evergreen tree that is planted in India and Japan. This tree is about 60 feet in height. It has an orange-brown fruit which contains a great deal of saponin. Another species of soapberry is grown in the tropical regions of America and is commonly known as the *chinaberry*. This species has small white flowers with orange-brown fruit. It grows to a height of about 30 feet. A third species grows in the United States from Missouri to Mexico. It has yellowish-white flowers and is deciduous, shedding its leaves in the winter.

J.J.L.

**Classification.** The soapberry is the common name for the genus *Sapindus*. The family is *Sapindaceae*. The evergreen trees are *S. mukorossi* and *S. saponaria*. The deciduous tree is the *S. drummondii*.

**SOAP PLANT** is a tall herb of California which reaches a height of about five feet. It grows from a bulb and has tufted leaves and white flowers streaked with purple. The leaves may be about a foot and a half long. The flowers spread open in the afternoon. The bulb was formerly used by the Indians as a kind of substitute for soap.

P.C.S.

**Classification.** The soap plant is *Chlorogalum pomeridianum* in the *Liliaceae* family.

**SOAP SCULPTURE** is the art of carving figures out of soap. Anyone with a little artistic feeling can be a soap sculptor. The hobby takes up very little space and requires no special tools. The best soap to use is a soft, white bar. A hard soap chips and leaves rough edges. All lettering and raised designs should be scraped from the soap.

Let us say the sculpture is to be of a sitting cat, with its tail wound around its legs. Both side views of the cat are drawn on paper. Then the outlines are traced on either side of the soap with a piece of carbon paper placed against the soap beneath the drawing. With a paring knife or pen knife, the sculptor cuts through the soap a quarter inch outside his outline. He now has a flat piece in the shape of a cat's profile. A good tool for finishing the model is an orange stick such as that used for fingernail care. Scraping and pressing in the proper places on the rough outline will produce the perky ears, the rounded back, and the graceful tail of the cat. Rubbing with the stick or the thumb will smooth any rough surfaces.

The finished model is left to dry for a few days. Then it is rubbed all over with a soft paper napkin, and then with the fingertip and palm of the hand. This rubbing gives it highlights. In time a piece of soap sculpture can acquire the lovely finish of old ivory. If desired, it can

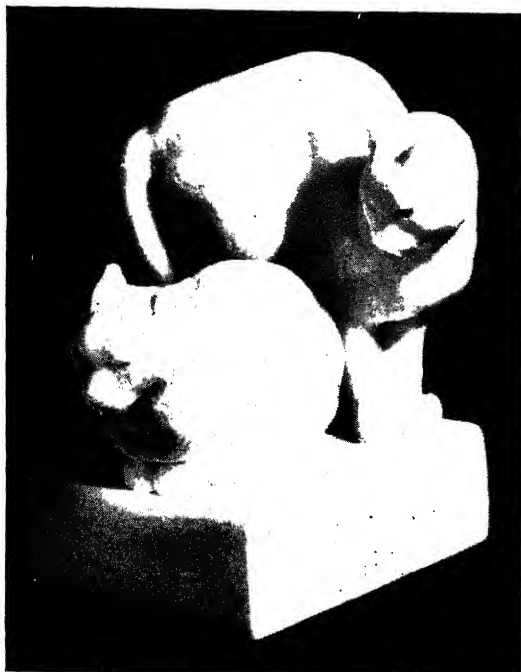
later be colored or gilded.

Until the outbreak of World War II, the National Soap Sculpture Committee held national soap sculpture competitions under the sponsorship of a leading soap manufacturer. Prizes totaling several thousand dollars plus scholarships were awarded to the outstanding competitors. E.S.

See also HOBBY (Books about Hobbies).

**SOAPSTONE** is a soft rock which is made up mostly of a mineral called *talc*. Soapstone is so called because it has a soapy or oily feel when it is touched, and is much more easily cut than most other rocks. Soapstone is also known as *steatite*. In color, it varies from white through gray and green to brown. It is generally impure and contains small amounts of other minerals such as chlorite and magnetite.

Industry makes use of soapstones in many ways. Because soapstone is resistant to heat, slabs of it are used for insulation in electrical equipment, fireless cookers, and switchboards. They also line laundry tubs and sinks. Pieces of light-colored,



This Soap Sculpture, "Siesta," won first prize in a national amateur soap-sculpture contest. Soap sculpture is both simple and cheap. A knife and a bar of soap are the only materials needed. The design is first drawn or traced on paper.

very soft soapstone are used by tailors in marking lines on cloth. This material bears the trade name of "French chalk." Ground into a powder, soapstone finds many uses, such as "filler" for paper, some grades of face powder, and certain paints. W.H.Bv.

See also TALC.

**SOAPWORT.** See BOUNCING BET.

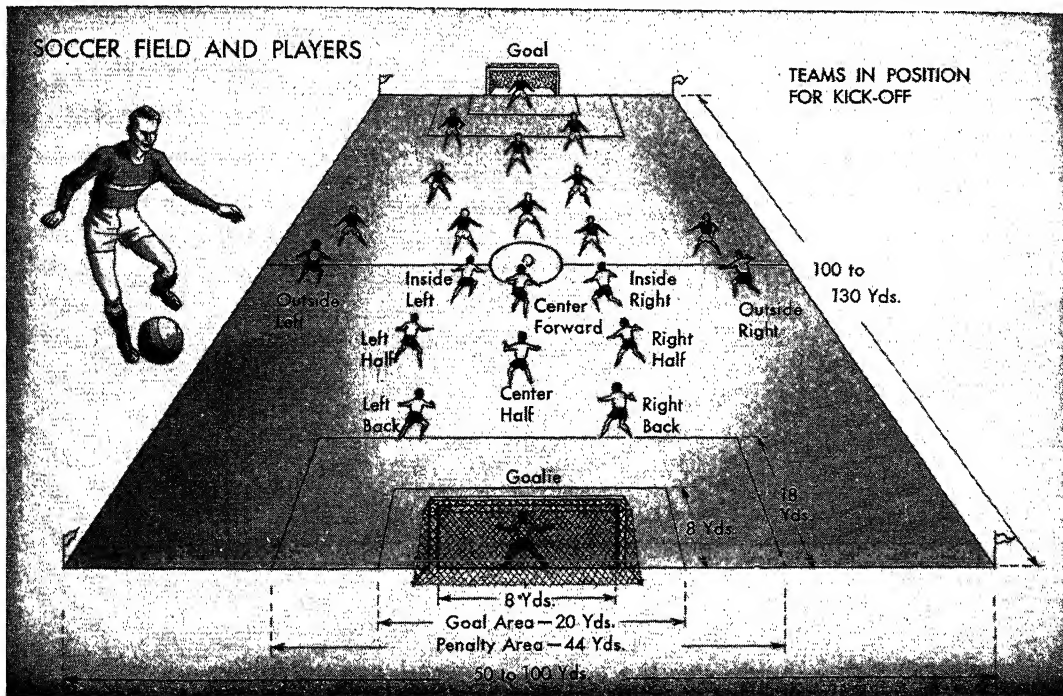
**SOBIESKI, JOHN.** See JOHN III SOBIESKI.

**SOBRANYE,** *so BRAHNYEH,* or **SOBRANJE.** See BULGARIA (Government).

**SOBRERO,** *soh BRAY-roh,* **ASCANIO** (1812-1888). See EXPLOSIVE.

**SOCCER,** *SOCK er,* is the original version of football. It is sometimes called ASSOCIATION FOOTBALL. Soccer was played in England as far back as A.D. 1100. The game was banned by royal command for about four hundred years. But in the 1600's it again became

popular. All football was soccer, a kicking game, until the game of Rugby was invented in the early 1800's. The London Football Association in 1863 objected to any departure from the practice of kicking the ball.



They called their game association football to distinguish it from any other. This came to be abbreviated to *assoc* and later was changed to the present name of soccer.

Soccer has become immensely popular and is played throughout the world. The game was generally recognized in the United States in 1913 when the United States Football Association was formed.

West Point and other American schools play soccer as a part of their regular sports program. It was the only football game of American schools until the 1870's when the American game began to take shape. Soccer crowds in Ireland, Wales, and Scotland are as large or larger than American football crowds. Games are played with teams from all parts of Europe.

Soccer is played with a round ball instead of an oval or elliptical one, as in football. Scoring is one point for each goal, as in hockey. No player except the goalkeeper may use his hands or arms to move the ball toward the opponent's goal. The others may kick the ball or butt it with their heads or shoulders.

Soccer teams are made up of eleven men each. The field is rectangular, 100 to 120 yards long. Its side lines are 55 to 75 yards apart. The halfway line cuts through a kickoff circle of ten yards radius. The teams line up beyond this center line. The first line has five attack men, and includes the two wings, left and right, the center forward, and the left and right inside players. In the second line are the left, center, and right halfbacks. These are both offensive and defensive players. In front of the goal tender are the two fullbacks.

The players usually dress in unpadded jerseys, shorts, shinguards, long stockings, and shoes with blocked leather toes. E.D.M.

**SOCIAL ANIMALS.** See **ANIMAL** (Animals That Live Together); **ANT** (How Ants Live Together); **BEAVER** (Life and Habits); **BEE** (Home Life of the Honeybee); **PRAIRIE DOG**; **TERMITE**; **WASP**.

**SOCIAL BEE.** See **BEE** (Kinds).

**SOCIAL CREDIT PARTY.** See **ALBERTA** (Politics; Progress as a Province).

**SOCIAL EDUCATION.** See **ADOLESCENCE** (Social Development).

**SOCIAL INSURANCE.** See **SOCIAL SECURITY**.

**SOCIALISM**, *so shal iz'm*, is both a doctrine and a movement which seeks to serve the interests of the masses of the people through social ownership and democratic control of the principal means of production and distribution. Ownership may be by national or local government, or by co-operatives. For example, the city ownership of an electric power plant is no less an example of socialism than is the ownership of railroads by a national government.

Democratic socialists insist that control must be democratic. They urge that socialized industries should be controlled by public corporations governed by directors representing both the consumers in general, and the workers who invest their labor in the particular industry. Co-operative associations, which are now common in many parts of the world, are much like socialism, because they extend ownership to many members of the community.

Socialism is a much-abused term. It does not mean

equal income for everyone, but it does imply more equality in income than is now common. It does not mean common ownership of personal belongings, such as shoes or toothbrushes. Nor does it mean political dictatorship, although a dictatorship might include a socialized economy.

**The World-wide Socialist Movement.** Most persons think of Karl Marx (1818-1883) as the founder of modern socialist principles. But other persons had advanced socialist ideas at an earlier period. The term *socialist* was first used in its modern sense in Great Britain in 1827. A few years later it was used both in France and Great Britain to describe the social ideals of François Marie Charles Fourier, Comte de Saint-Simon, and Robert Owen. In 1861 the first socialist party was founded in Germany. The movement rapidly gained strength and spread to other countries. World War I resulted in a temporary setback in socialist strength in most countries. But in Russia, a strong socialist group under the leadership of Nikolai Lenin overthrew the czarist government in 1917 and established a socialist republic of Soviets.

After World War I, socialism picked up new strength in many countries. It continued to grow through the 1920's and 1930's. The Fascist counter revolutions in Italy, Germany, Spain, and other countries during this period had the destruction of the socialist movement as one of their major purposes.

Fascist counterrevolutions reached a peak in World War II. Socialist groups emerged from World War II with renewed strength and increased membership. Today, almost every country of Europe and North and South America, as well as some countries of Asia, have socialist political organizations. Some of these organizations have great strength.

**Socialism and Communism.** There has been a long history in the development of differences between socialism and communism. Today the major communist parties hold that socialism has already been achieved in the Soviet Union. In their definition, socialism is a step on the road to communism. They defend dictatorship and the denial of all civil liberties. They still hold to Lenin's teaching that first the dictatorship and then the state itself will wither away once capitalism has been abolished. See **GOVERNMENT**.

Democratic socialists say that the economic system in the Soviet Union can best be described as state capitalism, that there is none of the democracy of control which is essential to socialism, and that obviously neither the dictatorship nor the state is withering away. Socialists oppose dictatorship and the abolition of civil liberties, and seek to bring about a peaceful transition to the new society. Socialists and communists disagree bitterly, and have seldom been able to work together.

**In the United States**, the Socialist party was organized in the 1800's. By 1904 its membership had increased to more than 400,000. By 1912 the socialist vote approached 900,000. Socialist votes increased to about 920,000 in 1920. By 1924, when the Socialists supported the Progressive candidate for President, Robert M. LaFollette, their voting strength was probably about a million. Since then, Socialist votes have varied greatly in number. The number of persons who accept Socialist principles may have gradually increased, but if this is

true, these persons have generally voted with one of the major parties. This was apparently the case in 1944, when only 80,419 Socialist votes were cast in the national elections.

The Socialist party platforms have commonly included demands for (1) the socialization and democratic control of natural resources, money banking and credit, and monopolies and semimonopolies; (2) better protection for workers and their families, such as higher wages and shorter hours, health and accident insurance, and old-age and mothers' pensions; and (3) the extension of free public education, and various political changes, including the direct election of the President and Vice-President, and some device by which, in case of deadlock between Congress and the President, an appeal can be taken to the voters.

The Socialist party has advanced many proposals for political reforms. Most of these are designed to make the national government more flexible and more responsive to the will of the public than it is at present.

An examination of developments in the United States since the War between the States indicates that the nation has traveled a great distance in the direction of more social legislation, and more government ownership and control of industry. These steps have been taken by the major political parties, which have always been careful not to use the term *socialism* in describing their program for fear of arousing possible prejudice.

In the minds of many persons, socialism is the answer to many problems of modern industrial society, such as unemployment, poverty, business cycles, and conflicts between capital and labor. But it is also clear that socialization is likely to bring new problems with it.

The Tennessee Valley Authority might be considered an example of modern socialist practice, although the Socialist party would make various changes in its administration. This vast enterprise is controlled by a board of experts who have been freed from political influence. The citizens of local communities in the region carry on much of the detailed administration. This gives the undertaking a certain democratic character. But the Socialist party would like to see a more direct representation of consumers and workers in the management of the Tennessee Valley Authority than there now is. See TENNESSEE VALLEY AUTHORITY. N.T.

**Related Subjects.** The reader is also referred to:

Anarchist	Co-operative	Political Party
Communism	Fabian Society	

#### SOME SOCIALIST LEADERS

Bebel, August	Owen, Robert, and Robert Dale
Berger, Victor L.	Proudhon, Pierre Joseph
Blanc, Louis	Saint-Simon, Claude Henri de
Briand, Aristide	Rouvroy, Comte de
Debs, Eugene	Thomas, Norman
Marx, Karl	

**SOCIALIST PARTY.** See SOCIALISM.

**SOCIALIZED MEDICINE.** See MEDICINE (Socialized Medicine).

**SOCIAL LEGISLATION.** See CHILD LABOR; CO-OPERATIVE; FAMILY (Progressive Family Life); HOUSING; HYGIENE (Public Hygiene); LABOR UNION (Activities of Labor Unions); SOCIAL SECURITY; WOMAN.

**SOCIAL ORGANIZATIONS.** See ORGANIZATIONS AND AGENCIES in the READING AND STUDY GUIDE.

**SOCIAL SCIENCE.** The scientist meets a puzzling situation, and gets an idea which may explain it. He then tests this idea in countless ways. He makes observations, sometimes dozens or even hundreds of them, to see if his idea, or *hypothesis*, will explain them all. He predicts some things that must follow if his idea is true, and then sets up experiments to see whether the things predicted do in fact happen. No matter how fond of an idea he may become, the true scientist will discard it as soon as it fails to meet the test of observed facts.

In the field of social living, the scientific method is not widely accepted. To the ordinary person, a belief or idea may be so dear that he will cling to it even when the facts show clearly that it need not be true, or that it is actually untrue.

Some persons hope that the scientific method can be applied to the study of human relations and institutions, as it has been applied to physics and chemistry. These persons give the name "social science" to such fields as politics, economics, sociology, anthropology, and history. Psychology and geography also are sometimes spoken of as social sciences.

Many educators, and others, doubt whether the methods of natural science can be used in the social fields. They argue that the controlled experiment, which is one of the most powerful tools of science, cannot be applied freely to human beings. Some also believe that there are better ways than science for finding out some kinds of truth. Both those who despair of applying scientific method to social living, and those who are opposed to it, prefer the term "social studies" to the name "social sciences." A.G.R.

See also BROOKINGS INSTITUTION; RAND SCHOOL OF SOCIAL SCIENCES; SOCIAL STUDIES.

**SOCIAL SECURITY.** Certain economic rights of the people came to be generally accepted in the United States during the four terms of President Franklin D. Roosevelt. The right to a job, to fair pay, to sufficient food and clothing, to adequate shelter and medical care, and to protection against pauperism in old age, are all matters which are included under the general idea of social security.

Before 1930 the only provisions of this kind in the United States were state workman's-compensation laws, old-age pensions and mothers' aid, private or industrial pension systems, private charity, and public relief. Other countries were far ahead of the United States in their efforts to make life more secure for individuals and their families. The Scandinavian nations have had broad social programs in effect since the early 1900's. Great Britain's pension and insurance systems for social security had their beginning in the 1897 Workmen's Compensation Act and the Old Age Pension Act of 1908.

The Social Security Act of 1935 started the United States on a program which is as wide in its coverage and as generous in its benefits as any to be found in the world. The benefits of the act were increased in 1939. There are two main parts of the program. One part is based on *social insurance* and the other part on *public assistance*.

#### How the Program Works

The social insurance program is in two parts, unem-

ployment insurance, which is a Federal-state program, and Federal old-age insurance.

**Unemployment Benefits** are paid in weekly amounts to workers out of jobs. The money for this comes from pay-roll taxes paid by employers and in some states by employees. According to the law, employers are supposed to pay 3 per cent of their annual payroll into the Social Security fund. About 44,000,000 workers were covered in 1945. Amounts paid ranged from \$15 to \$28 weekly, and extended over lengths of time of from sixteen to twenty-six weeks. There are about 15,000,000 workers in jobs not covered by this system. These include domestic and farm workers, and government and city employees.

**Old-Age and Survivors' Insurance** pays monthly benefits to retired workers over 65 years of age. Monthly payments, or lump sums, are also made to the families of workers who die. Payments are based on the average earnings and the length of employment of each worker up to a limit of \$85 a month. The average payment was about \$40 a month in 1945.

All the public-assistance parts of the Social Security program are directed by the states under Federal regulation. The costs are divided between the states and the Federal Government. This part of the program is divided into three main parts.

**Old-Age Assistance** is a program of financial aid to needy persons over 65. This is not related to Old-Age and Survivors' Insurance. In 1945 about 2,000,000 received \$726,000,000 in Old-Age Assistance.

**Dependent Children** helps children under 18

who have lost the support of both parents. In 1945 help was given to 649,000 of these children at a cost of \$149,000,000.

**Aid for the Needy Blind** relieves those unable to care for themselves but who are not living in public institutions. In 1945 this part of the program aided 56,000 people at a cost of about \$20,000,000.

### The Future of Social Security

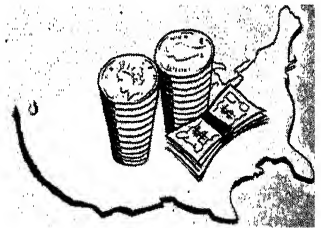
After the first ten years of experience with the workings of the social security program in the United States, most experts were agreed on two general ideas. First, that there would always be a need for social security, and a broad program must be maintained. Second, that a social security program is no substitute for an economic system which will give every citizen a chance to make his living in a useful job. With these points in mind, many plans have been made for the improvement of the present Social Security program. There are still almost 15,000,000 workers in the United States who are not covered by old-age insurance and unemployment compensation. Unemployment payments differ greatly from state to state because the amount provided by state laws is different. Also, the problem of administering a social security program is very complicated. The Federal Government takes part in at least thirteen different public-aid programs. Workers are confused as to which agency they should go when in need of help. Employers are irritated by having to file several statements, and feel that one should be enough. Leaders in the fight to improve social security, such as the directors of the Social

## SOCIAL SECURITY BENEFITS

### FEDERAL AND STATE AGENCIES



Unemployment—Workers Are Insured by State Laws



FEDERAL AGE



Dependent Children



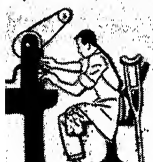
Child Welfare



Crippled Children



Maternal and Child Health



**Survivors.** A monthly pay or a lump sum,



**Old Age.** Monthly insurance benefits are paid to workers more than 65 years old.





H. Armstrong Roberts

**Social Service for Young Persons** helps to start less fortunate children on the road to good citizenship. If it were not

for this nursery school, these children might be playing games on the sidewalks of dirty, busy streets.

Security Board, are trying to do away with all such confusions.

Some indication of how important national leaders believe social security to be is shown in the 1944 Report on Social Security by the National Planning Association. This organization reported that a broad program would insure steady purchasing power and make for full employment because it would help to maintain markets on which business and agriculture can count. The report stated that: "Social insurance applies the sound principle of pooling risks to reduce individual hardship. The provisions of the present social security laws are far from adequate."

A much broader plan for social security had earlier been submitted to President Roosevelt by the National Resources Planning Board. The report of this board had four main points:

(1) Our economy must have a job for anybody able and willing to work. Young persons should be given a chance to obtain the education needed for any work they want to do.

(2) The social insurances should carry the load of providing income for older persons and all those temporarily out of work.

(3) A general public-assistance system must provide minimum aid and assistance when old-age insurance or unemployment compensation fail to cover loss of income.

(4) Public provision should be made for services necessary to the health, education, and welfare of the people when these services are not available. H.C.E.

**Related Subjects.** The reader is also referred to:  
Annuity Civil Service (Civil Service Laws)  
Beveridge, William, Sir Insurance  
Canada (Social Welfare) Mother's Pension

Old-Age Pension  
Pension  
Poor Relief

Townsend Plan  
Unemployment Insurance  
Workmen's Compensation

**SOCIAL SERVICE.** For many years, efforts to relieve poverty, reduce crime, or improve living conditions were thought of as charity, good works, and neighborly giving. The idea was that people who were well off could show their generosity and kindness by doing something for those who were less fortunate.

The term *social service* came into use as people began to realize that disease, crime, ignorance, and other results of poverty do not stop at district boundary lines. Social service is not merely an attempt to "do something" for the underprivileged. It is the sum total of organized effort made by a community to solve problems that affect the well-being of all its citizens. Social service naturally touches some persons more than others, but everyone in the community has a share in it.

**Types of Social Service.** Welfare work is as old as recorded history. Today much of it centers upon city slum dwellers, who are most in need of improved conditions for living.

Welfare work is of three general types: case work, group work, and community organizations.

*Case Work* includes such activities as studying a family to see if it needs public relief and is entitled to it. It deals also with family counseling, child care, the prevention of accidents, vocational guidance, probation and parole, old-age pensions, medical services, and the work of visiting teachers.

*Group Work* centers largely on the use of leisure time. Social-service workers provide leadership for such activi-

ties as folk art, adult education, and club work. This type of social service goes on in social settlements, churches, and schools, as well as in institutions for the aged, for delinquents, and for the physically handicapped. Group work was used extensively as a morale builder during World War II. Because of the great number of war wounded, group workers have recently given much attention to the matter of restoring physical and mental health.

**Community Organizations.** In many communities, social-service agencies have joined together in a single council. In this way they can join forces in a single yearly campaign for funds, and can co-ordinate and professionalize their work. The members of a community council are not individual persons, but groups such as civics clubs, government offices, churches, welfare-service agencies, labor unions, farm bureaus, and schools. The council is not just another organization in the community, but a kind of clearinghouse for civic action of all sorts.

**Theories of Social Service.** Authorities hold many different views on the nature of social problems, as well as on their causes and control.

One widely accepted method of attack on social problems, which is now losing ground, is the "practical-problems" approach. This point of view holds that social-service workers should make a direct attack upon anything in the community which they regard as an evil. For example, if drunkenness is widespread, the practical-problems approach might suggest that the community should force establishments selling liquor to close and thus make an end of the business.

Believers in the practical-problems approach take it for granted that if people would only get together, organize, and do something, their problems could readily be solved. They have a strong impulse to do good, and they assume that any act performed with good intentions will lead to good results. This idea finds little support in cold fact.

The most widely accepted theory of social service is the "maladjusted-individual" approach. According to this view, the good citizen is one who fits in. He has the habits, the attitudes, and the values which the community approves. He gets along easily, finds little to criticize in the community life, and faces few serious problems.

The maladjusted person, on the other hand, does not get along with people. He broods over his troubles, real or fancied, and does not feel at home in the world around him. He does not, and perhaps can not, join up, take part, get in on things, or "belong." As a result, he does not succeed among people.

According to the maladjusted-individual approach, the task of social service is to make changes in such a person so that he can "fit in." He must, somehow, acquire the desire and will to achieve, to succeed, to be happy in a conventional sense. He must learn to like what others like, to value what others value, and to become "more like other people."

A third theory of social service is that the causes of maladjustment are to be found not in the individual, but in the social structure. From this point of view, any sudden or abrupt social change is disorganizing.

Changes in one area of life will throw other areas out of gear, and thus produce maladjusted people.

According to this point of view, changes should come slowly, so that people have time to adjust to them. Changes in our ways of producing and distributing goods have come very fast. Our social ideals and ways of thinking have changed much more slowly. Technology, or the science of industry, keeps on advancing, and social ideas continue to lag behind. It follows that we must either slow down the changes in the material conditions of life, which would be a most difficult task, or else speed up changes in our ways of thinking, our laws, and our institutions.

These are only a few of the theories among which social-service workers have to choose. No one can claim that any one of the theories provides a sound basis for action in all situations, but generally the newer points of view seem better than the old ones.

**The Future of Social Service.** Whatever the causes of social problems may be, the existence of many socially maladjusted persons is a simple fact. No matter how social service may develop, it must always deal in some way with the person who can not or will not live as others do, abide by common rules for living, and solve his problems in ways regarded as normal. The maladjusted person is a problem to himself and often to others. He lives in a state of constant tension, the amount of which is the measure of his maladjustment.

Since no one can say exactly the direction that social service should take, it seems wise to carry forward action on all fronts, at the same time trying to develop a more adequate theory. One of the great needs is more and better education for those who can profit from it. Schools should try to help everyone toward a fuller understanding of the nature of our social order, and should encourage the attempt to discover ways of making life better for all who live it. Among other things, the schools should not dodge a thoughtful consideration of basic changes in the social structure.

L.A.C.

**Vocational Opportunities.** The professional social worker needs considerable training, and a college degree is required for nearly all positions. The average salary of the social worker is about equal to that of a secondary-school teacher or a public-health nurse. There is no record of anyone getting rich in social service work. But even beginners usually get a living wage.

Social work is exacting and hard on the nerves. Results are usually slow, and social workers often become discouraged. Only those who like people as people, and want to help them, can look forward to a happy career in this field.

**Related Subjects.** The reader is also referred to:

Addams, Jane	Poor Relief
Hull House	Poverty
Juvenile Delinquency	Social Settlement
Lathrop, Julia Clifford	Tenement
Pension	

#### WELFARE ORGANIZATIONS

Child Labor Committee, National	Jewish Welfare Board, National
Children, Societies for	Junior Leagues of America
Children's Bureau	Red Cross
Community Chest	Travelers Aid
Family Service Association of America	

Social Work, National  
Conference of

Social Workers, American  
Association of

**SOCIAL SETTLEMENT.** Social settlements are institutions which have grown up in many crowded cities during modern times. They are intended to educate people to better citizenship and to prevent crime.

Social settlements carry on many activities. These include kindergartens, citizenship courses, clubs for all ages, adult-education classes, libraries, baths, and savings banks. Many settlements have open halls where community groups may hold social, political, or religious meetings. Settlement workers have done much to bring about reform in state and city laws.

Men of Oxford University founded the first social settlement in London in 1884. The institution was known as Toynbee Hall. It grew out of the work begun by Arnold Toynbee in the crowded Whitechapel district of London. In 1887 Dr. Stanton Coit founded the University Settlement in New York City. Two years later, Jane Addams and Ellen Gates Starr opened Hull House in Chicago. Since then, social settlements have sprung up in many great cities.

Today many public institutions do social-settlement work. Adults and children are encouraged to take part in community programs. Social workers help individuals who do not have normal opportunities. The National

Association of Social Settlement has organized more than 240 settlements since 1911, and has sponsored an active program of social work. E.S.B.

See also ADDAMS, JANE; HULL HOUSE; SOCIAL SERVICE; TOYNBEE, ARNOLD; WALD, LILLIAN D.

**SOCIAL STUDIES.** The term social studies has never been clearly defined. In a sense, all studies are social, since they are carried on by human beings for human purposes. Astronomy, which broadens and clarifies man's picture of the universe he lives in, is in this sense a social study. So are chemistry, physics, biology, geology, zoology, and the rest of the so-called natural sciences.

In a narrower sense, the name social studies is given to the fields of civics and politics, history, anthropology, economics, and sociology. Each of these fields is directly concerned with the study of human institutions, customs, and behavior.

The line between the social studies and other areas can not be sharply drawn. For example, geography can be taught either as a social study or as a natural science. Psychology touches every field of the social studies. The study of a language is not usually classed among the social studies, but it might well be. Language, like government, is an important human institution, and there is no clear reason why the study of one such institution



Madison Public Schools

High-School Students Prepare a Lesson in Current Events as Part of Their Work in Social Studies

should be considered more "social" than the study of another.

**In the Schools.** Colleges and universities teach all the social studies as separate branches. Most larger institutions have separate departments of history, political science, economics, and sociology. A few institutions have also developed courses or seminars which in one way or another attempt to pull together the various social-studies areas.

In high schools, most of the time devoted to the social studies is spent on history. Most schools have courses in civics or government, but these are often taught as a part of the American history course. Many schools also have courses in general social studies, often under such titles as social problems, or problems of democracy. These courses differ widely in content, method, and aim. A few high schools give separate courses labeled "economics" or "sociology," but an observer can scarcely tell them from the general social-studies courses.

In elementary schools, units of study are often set up which center upon the local community, or upon some single institution within it. There are also units dealing with the ways of life in other lands. Thus the elementary-school curriculum generally has a great deal of social-studies content, even when no course called "social studies" is offered. Some elementary schools and most junior high schools give courses in history, geography, and civics. Geography in the modern elementary school and junior high school usually has a strong social-studies emphasis. The civics courses may include almost anything. It is not unusual for the courses in English and literature to be richer in social-studies content than are the courses in history, geography, and civics, which might be expected to place more emphasis on such content.

**Purposes of the Social Studies.** For many years, social-studies teaching throughout the world had as its chief purpose the development of national pride and national patriotism. Many teachers still hold to this purpose. A few take the position that the social studies should be taught in such a way as to develop an appreciation for the institutions and customs of other lands, in the interest of developing world citizenship. Probably the most widely accepted view is that the social studies should give young people a chance to examine thoughtfully the social order in which they live, and to compare it with other possible ways of doing things, so that they can take an intelligent part in the improvement of our way of life.

**Social Studies versus Social Science.** Professional scholars, especially in the fields of economics, sociology, and government, sometimes prefer to speak of their fields of specialization as *social sciences*, rather than *social studies* (see SOCIAL SCIENCE). But the name *science* is not correctly applied to elementary- and secondary-school work in the social studies. L.A.G.

**Related Subjects.** Students and teachers working on social-studies units are referred to articles on the various states, countries, and continents in THE WORLD BOOK ENCYCLOPEDIA, such as AUSTRALIA; CALIFORNIA; CHINA; PACIFIC ISLANDS. The following articles are on subjects frequently covered in the social-studies curriculum of elementary and secondary schools:

Aegean Civilization  
Ancient Civilization

Arab  
Civilization

Colonial Life in America  
Communication  
Community  
Conservation  
Economics  
Eskimo  
Exploration and Discovery  
Farming and Farm Life  
Fire Department  
Food  
Freedom  
Geography  
Government  
Home Life  
Indian, American  
Industrial Revolution  
Intercultural Education  
Invention

Jew  
Labor  
Map and Map Reading  
Middle Ages  
Negro  
Pioneer Life  
Post Office De  
Primitive Man  
Propaganda  
Races of Man  
Roman Empire  
Safety  
Shelter  
Trails of Early Days  
Transportation  
Westward Movement  
Woman

**SOCIAL SURVEY.** See SOCIOLOGY.

**SOCIAL WAR.** See ROMAN EMPIRE (Last Hundred Years of the Republic).

**SOCIAL WELFARE.** See SOCIAL SERVICE.

**SOCIAL WORK, NATIONAL CONFERENCE OF.** This Conference "exists to facilitate discussion of the problems and methods of practical human improvement, to increase the efficiency of agencies and institutions devoted to this cause and to disseminate information." The Conference has about 7,000 members. About 500 of these are agency or social-work organization members, and the rest are individuals.

The organization publishes a quarterly *Conference Bulletin* and an annual volume of proceedings, which contains a selection of papers given at its annual convention which is held in a different section of the country each year. The Conference has headquarters in Columbus, Ohio.

**SOCIAL WORKER.** See SOCIAL SERVICE (Vocational Opportunities).

**SOCIAL WORKERS, AMERICAN ASSOCIATION OF,** is a society which works for a high standard of professional social-service work. The association supports legislation for modernized welfare services and for improved living standards. It was founded in 1921, and has about 11,200 members, organized in 98 chapters. The association publishes *The Compass*. It has headquarters in New York City. J.P.A.

**SOCIETY.** See CIVILIZATION; also ORGANIZATIONS AND AGENCIES IN THE READING AND STUDY GUIDE.

**SOCIETY FOR THE ADVANCEMENT OF EDUCATION, INC.,** was organized in 1939 to take over the ownership and continue the publication of the educational journal *School and Society*. Interested persons donated money to help the society buy the journal. Today the society has a membership of more than 3,000. It has headquarters in New York City. L.R.B.

**SOCIETY FOR THE PREVENTION OF CRUELTY TO ANIMALS** is the name for many organizations which do important work in preventing the mistreatment of animals. These anticruelty societies influence governments to pass laws providing for the punishment of persons who mistreat animals. Contributions support the work.

In some places, anticruelty laws passed through the influence of these societies regulate the treatment of captured wild animals as well as that of tame animals. Laws in most countries provide fines and imprisonment



Warren W. McSpadden

**The Society for the Prevention of Cruelty to Animals** is a good friend to all animals which need help.

for persons guilty of cruelty to domestic animals. Railroads must rest, feed, and water livestock which is carried a long distance.

The first humane society was founded in 1824 in England, and the second was formed in Scotland in 1839. The first American anticruelty society was founded in New York in 1866, under the leadership of Henry Bergh. There are now societies in nearly every country. G.A.H.S.

See also BERGH, HENRY.

**SOCIETY FOR THE PREVENTION OF CRUELTY TO CHILDREN.** See CHILDREN, SOCIETIES FOR.

**SOCIETY ISLANDS** are a group of French Islands in the Pacific Ocean. They lie about 4,220 miles southwest of San Francisco, and are slightly northeast of the Cook Islands. Credit for discovery is given to a British navigator, Captain Samuel Wallis, who claimed the islands for Great Britain in 1767. The French navigator, Louis Antoine de Bougainville, claimed the islands for France in 1768.

Twelve islands make up the Society Island group. Tahiti and Moorea are the largest and most important of these islands. The Society Islands cover an area of 650 square miles, and have a population of 25,412.

Most of the Society Islands are rough and mountainous, with many high peaks and ancient volcanoes. Some of the islands are low atolls, and are used as fishing centers. All the islands are covered with rich tropical vegetation. The capital of the island group is the busy seaport of Papeete, on Tahiti.

The natives of the Society Islands are Polynesians. Many of them are fishermen and pearl divers. E.E.E.E. See also TAHITI.

**SOCIETY OF FRIENDS.** See FRIENDS, SOCIETY OF. **SOCIETY OF JESUS.** See JESUIT.

**SOCIETY OF THE CINCINNATI.** See CINCINNATI, SOCIETY OF THE.

**SOCIOLOGY** is the study of society. Even among sociologists themselves, there is wide disagreement as to just what the term includes. The quickest way to get an idea of the nature of sociology is to consider,

first, what is taught under that label, and second, what the professional sociologist does.

**Sociology in Schools and Colleges.** Sociology as a subject is not taught in elementary schools or junior high schools. But units dealing with home life, local institutions, community living, current events, or the peoples of the world, can properly be called sociological. In this sense, the amount of sociology taught in elementary schools and junior high schools has increased greatly during recent years, but it still represents a very small part of the school curriculum.

Senior high schools in large cities sometimes offer courses called sociology. These are nearly always devoted to the study of current social problems, and they generally have a strong moral flavor. They seldom teach students to gather and interpret information, or how to analyze and understand the life going on about them. This is partly because the preparation of high-school teachers rarely includes more than a single introductory course in general sociology, which provides little or no experience in making field studies.

Much more common than high-school courses called *sociology* are courses taught under such titles as *problems of democracy*, *social problems*, or *general social science*. These courses differ very little from those labeled sociology, either in content or in method. It is fair to say, however, that more and more sociological materials are finding their way into the high-school curriculums, and that high-school students learn almost nothing of the methods of sociology.

At the college level, sociology is emphasized more in the United States than anywhere else in the world. A recent survey covering two thirds of the 928 four-year colleges in the country showed that 5,544 courses in sociology were offered. The courses having the highest enrollment were, in order: general sociology, or principles of sociology, social problems, marriage and the family, social work, and criminology. Other widely taught courses included social psychology, rural sociology, race relations, urban sociology, population, child welfare, and community organization. Thirty-nine different types of sociology courses were reported in the survey.

**What the Sociologist Does.** There are many kinds of sociologists. Each has his own field of specialization. A sociologist may specialize in such fields as the study of race relations, family life, industrial sociology, or criminology. To get any clear idea of the work of the sociologist, we must pick a particular kind of sociologist and consider, step by step, what he does when he attacks a problem.

Let us suppose that our sociologist specializes in the study of community. He wants to make a study or social survey of a particular small town. He will begin by making some observations, and perhaps by classifying the town in a very general way. For example, he may say, "This is a *primary community*, for people carry on most of their affairs through personal, face-to-face relationships with others." Next, he may observe that the town is a farmers' trading center, and thus the community will include many who are beyond the town limits.

When the sociologist has blocked out the community



boundaries, he makes maps of the area, showing such things as land use, the layout of roads, and the location of institutions. He investigates the population, and describes it in terms of number, age, sex, vitality, social-economic status, and the like. He gives particular attention to the ways in which the people ordinarily spend their time.

When he has gathered these general facts and arranged them conveniently, the sociologist will ask himself what holds this town together, gives it unity, and makes it a single integrated community. He already knows that every community has some sort of "success system," which a person uses to tell whether or not he is "getting ahead." He knows also that this success system, or *status system*, is the thing that unifies an average community and fits it into the larger social life of the nation. He therefore turns his attention to the ideals and values by which the people of the community win social approval, gain recognition, and "rise in the world."

This much the competent sociologist is almost sure to do. He may then turn his study in a number of special directions. For example, if there are racial, religious, or national minorities in the community, he may ask himself how they fare in the social order. He may turn his attention to the upbringing of the children, and investigate how they are made part of the community life, and how they are taught to carry on the existing system. Or he may study the services used by the town, including those furnished by its own institutions, those obtained from near-by larger centers, and those that come from the country's capital, or from anywhere in the present interdependent world.

It is important to remember that the foregoing description applies only to one type of sociologist carrying on one particular kind of investigation.

**What Is Sociology?** Our discussion shows that there is no way of defining the term sociology in a few words. Most authorities will agree that sociology has four major phases. It is a field of study, a body of knowledge, a set of methods, and a distinctive point of view or way of looking at the world.

*As a Field of Study.* sociology is interested in the ongoing give and take, push and pull, of associated living. It studies also the forms and standards of social living, the folkways, customs, and institutions which make up what is called culture. The term *culture* means the whole of man's heritage, the "cumulative product of mass living."

The sociologist is interested also in personality, the inner mental and emotional side of culture, as it develops out of group processes. Thus the sociologist's field of study centers about three related ideas—group process, culture, and personality.

*As a Body of Knowledge.* There is no easy way of summing up what sociologists have found out about human society. A considerable body of knowledge has been accumulated about the nature of the group process, the origin and growth of culture, the community and its institutions, social disorganization, crime and other social problems, human nature, social progress, social control, and social planning. At its higher levels, sociology overlaps dozens of other fields, such as history, economics, and political science. In the same way,

the sociologist makes use of what the biologist, the geographer, the historian, and many other types of scholars, have found out.

If the sociologist had to use only the materials which clearly belong to a body of knowledge called sociology, he simply could not work at all. This difficulty is not peculiar to sociology. It has become just as hard to draw a line between chemistry and physics as it is to say where sociology leaves off and psychology, or history, or something else, begins.

*As a Method.* Methods in sociology are of two basic types: *subjective* and *objective*. A method is called objective if it can be reduced largely to a series of clearly described steps, so that another investigator can almost exactly follow it. Objective methods range from the use of census data or other public records such as community surveys or group observation forms, to various kinds of mapping, questionnaire inquiries, and experimentation. Subjective methods are those which can not easily be repeated by another investigator. Examples are the case method, or the making of individual life histories, case studies, and descriptive analyses, or the use of participant-observer techniques in which the sociologist joins the group he is observing and becomes part of it.

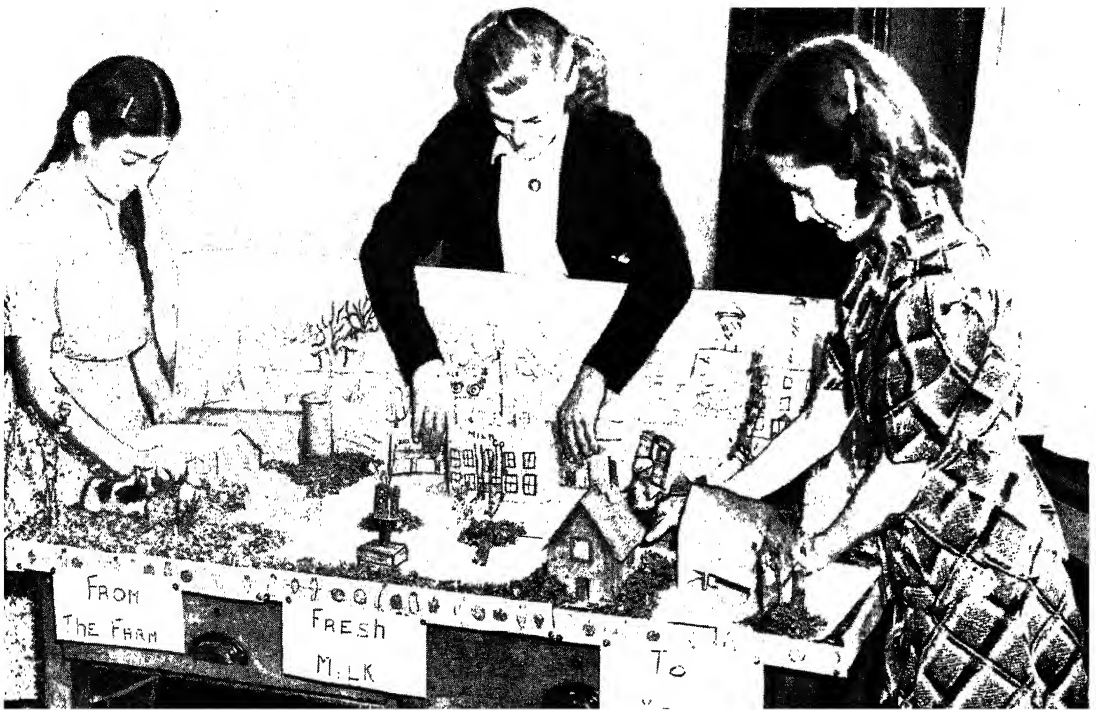
No method is perfectly subjective or perfectly objective. In general, subjective methods depend more on personal judgment and insight, and therefore yield less reliable results. But there are many situations, important and worthy of study, in which objective methods could scarcely yield any results at all. Each type of method, like any other tool, is good for what it is good for, and can be misjudged or misused.

*As a Point of View.* Sociologists do not agree on the point of view which the field should represent. As a scientist, the sociologist must be able to take a "suppose-nobody-cares" attitude when he is working with data. He must deal thoroughly with all the facts, and give his total allegiance and loyalty to the search for truth. Some sociologists believe that this statement is a full description of the point of view which sociology ought to represent.

Others argue that the sociologist should seek to draw conclusions as to what can and should be done by man to better his way of life, and to aid the growth of humanitarianism. They point out that no sociologist can investigate everything, and that what a man picks out as a problem for investigation depends upon what he considers important and worth while. According to this point of view, the sociologist is a human being like anyone else, and has the same social responsibilities as any other person.

**History of Sociology.** About a hundred years ago the French philosopher Auguste Comte gave the name "sociology" to a new field of knowledge which he proposed to found. This new "science" was to be a product of all the separate social sciences, and was in turn to unify and integrate them. It would offer students an over-all view of social life, and even of its forerunners in animal and plant society.

Only of late has this "master science" idea lost favor among those who work in the field. Some older sociologists still take Comte's view, but younger scholars regard sociology simply as another one of the social sciences.



go Board of Education

#### Junior Sociologists Study a Phase of Community Life to Learn How Different Factors Influence the People

The name *sociology* began with Comte, but sociological work was undertaken somewhat earlier with the studies of English prison life carried on by John Howard. Howard's purpose was to humanize the treatment of prisoners. Much later, Charles Booth made similar "type studies" of London slums, which were followed in the United States by the slum exposures of Jacob Riis, Jane Addams, Lincoln Steffens, and others. These social reformers had a serious interest in improving mass living, and their work did much to shape modern sociology.

In the middle 1800's, a few great European scholars began an effort to make sociology an exact science. The most important steps in this direction were Frederick Le Play's actual studies of "folk, work, and place." From this beginning, the idea developed that sociologists should try to express their findings in mathematical symbols and measured averages. The great achievements of physical scientists influenced many sociologists toward the point of view that whatever exists at all exists in some amount and can be measured, and that sociology should be a "pure" science, with no immediate, active interest in improving social living.

The field of sociology is so new that nearly every point of view developed during its history is still represented by active, working sociologists. There is a growing tendency toward specialization in the field. Many authorities look upon anthropology, criminology, and several other branches as separate, independent disciplines.

L.A.G.

**Related Subjects.** The reader is referred to the section on **SOCIOLOGY** in the **READING AND STUDY GUIDE** and to the following general articles:

Anthropology  
Civilization  
Community  
Comte, Auguste  
Criminology  
Economics  
Family  
Farming and Farm Life  
(Life on the Farm)

Immigration and Emigration  
Industrial Relations  
Intercultural Education  
Political Science  
Population  
Social Science  
Social Service  
Social Studies

**SOCK.** See **AIRPLANE** (Instruments and Safety Devices).

**SOCKEYE SALMON.** See **SALMON** (Kinds of Commercial Salmon).

**SOCRATES**, *SAHK rah teez* (469?-399 B.C.), was one of the greatest of the Greek philosophers. He left no writings of his own, and his philosophy is known only through the writings of his pupil Plato. Socrates' guiding rule was "Know thyself." He believed that goodness was based on knowledge and wickedness was based on ignorance. Socrates argued that no man is really bad.

Socrates sought truth all his life. His chief work was among the young men of Athens. He felt it was his duty to lead them to a nobler moral life. His method of instruction is known as the Socratic method. It was a form of cross-examination which tangled even the wisest in a net of errors. Socrates would pretend to know nothing of the subject under discussion, and by a series of carefully directed questions would make the other person find out the truth for himself.

Socrates was born in Athens, the son of a sculptor. He received little education in his youth, but later became familiar with the best philosophy and thought of his times. For a while, he was a sculptor like his father, but he soon gave this up. He walked in the

streets and market places, talking to people about the soul and the moral life of man in general.

As a teacher, Socrates was not popular with the citizens of Athens. He had an ugly appearance. His body was short and squat, and his walk was like a pelican's waddle. Socrates was too taken up with his work to worry about his looks, and his clothes were often dirty and ragged. His wife Xanthippe is supposed to have been a bad-tempered woman, but he lived with her to teach himself self-control. His ideas were also attacked by other philosophers. Some called him a Sophist. See SOPHIST.

Socrates was also noted as a soldier. He fought at Delium in 424 B.C. and at Amphipolis in 422 B.C. and gained a wide reputation for bravery. But he refused to take any further part in public affairs because he was afraid he would have to go against his sense of truth and justice if he did. Socrates made the citizens of Athens angry many times because he refused to give up his principles. After the naval battle of Arginusae in 406 B.C., he spoke against the citizens when they unjustly demanded the death of ten generals who had been unable to bury the dead. Again, in 404 B.C. during the period of terror which followed the death of Pericles, Socrates went against the orders of the Thirty Tyrants who ruled Athens. Socrates would have been condemned to death for his disobedience, but the government of the Thirty Tyrants was soon overthrown.

Finally, in 399 B.C. Socrates was charged with introducing new gods and not worshiping the old gods. He was also charged with corrupting the youth of Athens by his teachings. A clever lawyer might have been able to allow Socrates to escape with a light sentence, but he refused to have a lawyer. Instead he gave his own defense, the famous "Apology of Socrates," which ex-

plained his life. Socrates proved in this speech that he was not being tried for any crimes. But his beliefs and way of life were a menace to the tyranny of the state, and he was found guilty and condemned to death.

Socrates spent his last hours talking with his friends. When night came, he drank a cup of hemlock, a poison which the Athenians used for executions, and made a toast to the gods. Then he lay down on his couch and died in peace. See also PLATO; XANTHIPPE.

B.B.

**SODA** is the common name for a group of compounds which contain sodium. These sodium compounds are manufactured from common salt ( $\text{NaCl}$ ), which is made up of sodium and chlorine. One common sodium compound is *sodium carbonate* ( $\text{Na}_2\text{CO}_3$ ), which is known as *sal soda*, *washing soda*, and *soda ash*. Sodium carbonate comes in crystals or white powder and has a strong alkaline reaction. This means that soda neutralizes acids. Sodium carbonate is used in the making of glass, soap, and paper. It is also used as a disinfectant, cleaning agent, and water softener.

Sodium bicarbonate ( $\text{NaHCO}_3$ ) is a popular soda which is used in cooking and in medicines. It is also known as *baking soda* or *saleratus*. It is contained in baking powder and is known as a leavening agent because it causes bread, biscuits, or pastries to rise in baking. Sodium bicarbonate is also contained in Seidlitz powders, which are used to relieve excess acid in the stomach.

Sodium hydroxide ( $\text{NaOH}$ ) is a sodium compound known as *caustic soda*. Sodium hydroxide is used in the making of hard soap, paper, and dyestuffs. It is also used in making bleaching compounds and in refining petroleum.

G.L.Bu.

See also BAKING POWDER; BENZOATE OF SODA; SEIDLITZ POWDERS.

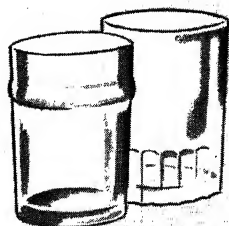


Historical Pictures

**Socrates Drinking the Cup of Hemlock** to carry out the sentence of death imposed on him by the rulers of ancient Athens. His followers are in despair as the great philosopher

raises the cup to his lips. Socrates made a toast to the gods and drank the bitter poison. He met death with the same calm and self-control with which he had lived.

## SOME USES OF SODIUM



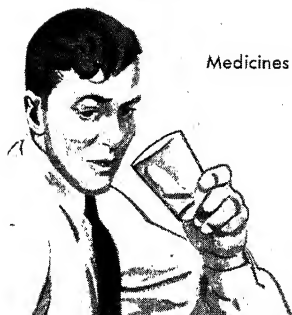
Glassmaking



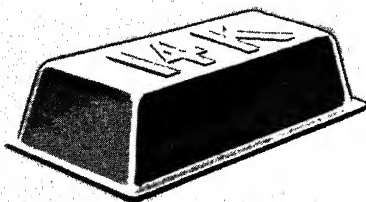
Fertilizers



Preservatives



Medicines



Gold Production



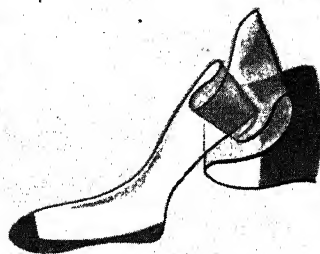
Insecticides



Photography



Treatment of Nervous Diseases.



Rayon Manufacture

**SODA LYE.** See CAUSTIC.

**SODA POP.** See CARBON DIOXIDE; SOFT DRINK.

**SODA WATER.** See CARBON DIOXIDE; SOFT DRINK.

**SODDY, FREDERICK** (1877- ), is an English chemist, noted for his work in the field of atomic structure. In 1902 he and Ernest Rutherford made the first explanation of radioactivity. They explained that radium breaks down by itself and gives off electrons, helium nuclei, and gamma rays, which are similar to X rays. Soddy also originated the term *isotope* which refers to atoms of the same element which have different weights. Soddy was born at Eastbourne, Sussex, and studied at Oxford University. In 1900 he taught at McGill University in Montreal, Canada, and later at the University of London. Soddy received the Nobel prize for chemistry in 1921. He taught at Oxford University for seventeen years, until he retired in 1936. See also NOBEL PRIZES. B.J.

**SODERBERG CELL.** See ALUMINUM.

**SÖDERBLOM, SUH der bloom, NATHAN** (1866-1931), was a Swedish preacher and teacher. He was awarded the Nobel peace prize in 1930 for his writings and speeches in favor of world peace. Söderblom was born in Trönö. In 1901 he became professor of church history at the University of Uppsala. He later became chancel-

lor of this university. In 1914 he was appointed head of the Swedish Church and held this position until his death. See also NOBEL PRIZES. W.W.S.

**SOD HOUSE** is a house with walls built of sod or turf in horizontal layers. They were built by early settlers on open plains where there were no trees to supply lumber. For a description of sod houses and how they were built, see PIONEER LIFE (Sod Houses; illustrations, Log Cabin; Dugout; Sod House).

**SODIUM** (chemical symbol, Na) is a silvery-white metal element. It is part of a group of metals known as the alkali group. Sodium has an atomic number of 11 and an atomic weight of 22.997. It is a very soft metal, and can easily be molded or cut with a knife as though it were wax. It is lighter than water. Sodium is found in large quantities only in combination with other elements. It is never found in the pure state.

Sodium salts are found in the bodies of animals and in most plants. Sodium compounds are found in the ocean, in salt lakes, in salt deposits, and in rocks. Common table salt (NaCl) is one of the most familiar sodium compounds. Baking soda, or bicarbonate of soda, is another. It is estimated that the solid crust of the earth contains about 2.6 per cent of sodium. Sodium is found in Chile as sodium nitrate, or saltpeter, in California as

sodium borate, or kernite, and in certain salt-lake areas as sodium carbonate.

The outstanding property of sodium is that it is very active chemically. It decomposes, or breaks up, water and reacts readily with such nonflammable substances as chlorine and oxygen.

Sodium

exposed to

after it has been exposed for a while. It also reacts immediately with water, forming sodium hydroxide and hydrogen gas. This reaction is so violent that if sodium is thrown upon hot water, enough heat is given off by the chemical action to set the hydrogen afire. Because sodium burns so quickly, it is stored in kerosene or naphtha. When sodium is melted in a flame it causes the flame to turn yellow. Under the spectroscope, this sodium vapor shows up as a yellow line.

Sodium has many of the same properties of another element, potassium. For this reason, sodium and potassium are often called the "great twins of chemistry." This similarity is an advantage commercially because sodium compounds are cheaper than potassium compounds, and sodium compounds are often substituted for potassium in industry.

Sodium was discovered in 1807 by the scientist Sir Humphry Davy, who first isolated the metal. Since then, various processes have been developed to separate the metal from its compound. The method most commonly used today is *electrolysis*. In this method, an electric current is passed through a sodium compound, such as melted sodium chloride. This current separates the compound into sodium metal and chlorine molecules, thereby freeing the sodium. During this process, the compound is kept from being exposed to the air. Sodium is also prepared by electrolysis of melted sodium hydroxide.

Sodium has been used in the laboratory for scientific research. The element sodium has been changed to a form known as its isotope, by bombarding sodium with deuterons. This isotope gives off certain rays known as *beta rays* and is known as *radiosodium*. Radiosodium is radioactive and this isotope has been used in medical research.

In industry, sodium compounds have been used in agriculture, medicine, photography, mineralogy, and manufacturing of synthetic products. *Chile saltpeter*, or sodium nitrate, is a valuable fertilizer, and was formerly the chief source of nitric acid. *Sodium fluoride* is used as an insecticide. *Sodium sulfide* has been used in the manufacture of cheap glass. *Sodium sulfate* has also been used in medicines, where it is known as *Glauber's salt*. Other medicinal sodium compounds are *sodium bromide* and *sodium iodide*, which are used in treating nervous diseases. In photography, *sodium thiosulfate* has been used to fix the photographic image. *Sodium cyanide* has been used in extracting gold from its ore. G.L.Bu.

See also ALKALI; GLAUBER'S SALT; SALT; SALTPETER; SODA; SODIUM PENTOTHAL.

**SODIUM BENZOATE**, another name for benzoate of soda. See BENZOATE OF SODA.

**SODIUM BICARBONATE**. See SODA.

**SODIUM CARBONATE**. See CARBONATE; SODA.

**SODIUM CHLORIDE**. See CHLORIDE.

**SODIUM FLUORIDE**. See INSECTICIDE.

**SODIUM HYDROXIDE**. See CAUSTIC; SODA.

**SODIUM NITRATE**. See SODIUM.

**SODIUM PENTOTHAL**, *PEN toh thal*, is a drug that has been called the "truth serum." When it is injected into a person's veins, it brings on a state of hypnosis. Then the person may tell things he has forgotten or is trying to hide. This drug, which is not really a serum, has the chemical name *sodium ethyl thiobarbiturate*. Sodium pentothal has been used on criminals, but American courts do not recognize as legal evidence any statements people make while drugged. A more important use is in the treatment of certain mental conditions, such as amnesia (loss of memory), schizophrenia, and combat neurosis. People with these conditions have thoughts locked in their subconscious minds. The truth serum loosens the inhibitions which keep these thoughts from coming into the open. In the treatment called *narcosynthesis*, the doctor talks to the half-sleeping person, to draw out or suggest the buried thought. Then the patient may describe or even act out some hidden experience. G.L.Bu.

**SODIUM TETRABORATE**, *TET rah BO rayt*. See BORAX.

**SODOM**, *SAHD um*, was one of the ancient cities on the plain around the Dead Sea. It is believed that the place where the city stood is now beneath the waters near the south end of the sea. During early Bible times the region was so fertile it was compared to the "garden of the Lord" (Gen. 13:10). But later, according to the Old Testament, God destroyed Sodom and the neighboring city of Gomorrah, because the people were wicked. The Old Testament also tells how Lot, the nephew of Abraham, escaped from Sodom just before its ruin. Lot and his wife had been warned by two angels to flee the city and not look back. Lot obeyed, but his wife took a last glance at Sodom. She was immediately turned into a pillar of salt. W.A.L.

**SODOM, APPLE OF**. See APPLE OF SODOM.

**SO FAR**. See RADAR (Peacetime Uses).

**SOFFIT**, *SAHF it*. See ARCHITECTURE (Terms).

**SOFIA**, *SO fee yah* (estimated population 401,300), is the capital and chief trading center of Bulgaria. The city lies on a high plain between the Vitaska Mountains and the main Balkan mountain ranges. Sofia has many factories, and carries on a thriving trade in silk, rose perfumes, and tobacco.

Sofia has been largely rebuilt and modernized since 1879. The most important new buildings are the King's palace, the Cathedral of Saint Alexander, and the House of Parliament. Another modern building houses the Sofia University, which was founded in 1888. The ancient ruins of the Mosque of Buyuk lie in the old section of the city.

Early Sofia was a Roman city. The Huns invaded the city during the 400's, and the Bulgarians occupied the city 400 years later. Between 1382 and 1878, Sofia was under Turkish rule. Sofia contributed to the German war effort during both World Wars I and II. Soviet troops invaded Sofia toward the end of World War II. See also BULGARIA (illustration). T.Z.

**SOFTBALL** is a modern American game developed from indoor and playground baseball. Followers of softball claim that it has more players and draws more



spectators than any other sport in the world. The game was originated in 1887 by George W. Hancock of the Farragut Boat Club, in Chicago.

Hancock designed the game for indoor play with a sixteen-inch ball having seams turned out. Indoor baseball, as it was then called, quickly became a popular sport. But it took hold faster as an outdoor game than as an indoor one. Soon after the game was invented, it was played on ball diamonds throughout the country. In 1923 the National Recreation Congress appointed a committee of recreation executives to draw up official rules and standardize the game. Many of the rules passed were later changed by a Joint Rules Committee of Softball formed at Chicago in 1933. The game is now governed by the Amateur Softball Association.

Softball takes little equipment, space, or training. It is therefore popular with players of all ages. Softball has a leading place in the sports programs of playgrounds, recreation centers, schools, industries, and military groups. Many softball games are played at night under lights and attract large crowds. Women have also taken to the sport, and girls' leagues have been formed throughout the nation. For the expert players, two world series are held at the end of each season to determine the national champions. One is for men, the other for women. The sport has had many different names, such as indoor baseball, playground ball, diamond-ball, kitten-ball, mush-ball, indoor-outdoor ball, and recreation ball. But the name *softball* is now generally considered the official title of the sport, and is the name most often used.

Softball as now played uses a twelve-inch in-seam ball which insures fast pitching. The pitcher's box is forty-three feet from home plate. The base lines are fifty-five feet long, and base runners must keep contact with the base until the pitcher has completed his delivery. Another unofficial type of softball is played with a larger, out-seam ball, resulting in slower pitching. The bases are only forty-five feet apart.

But all softball games differ from baseball in several ways. All softball pitching is done underhand. For many years ten players were used instead of nine, the extra player being a short-fielder, but now nine has become the standard number. A pitch that hits a batter is called a ball and is dead. Seven-inning games are official. There is no base stealing as in baseball.

E.D.M.  
See also BASEBALL; HOBBY (Books about Hobbies).

**SOFT DRINK.** The soft drink has become as typically American as the hot dog and chewing gum. Soft drinks

are called soft to distinguish them from alcoholic (hard) beverages. Soft drinks are often called "pop."

Almost all soft drinks are made of soda water, flavorings, and sugar. In the United States, the most popular soft drinks are those flavored with the extract of the kola, or cola, nut. This nut grows on two types of trees which are grown in tropical America. Various fruit flavors, such as strawberry, raspberry, orange, lemon, and lime, are also popular in soft drinks.

Soda water, the most important part of soft drinks, contains no soda. It is distilled water charged with carbon dioxide gas, which causes the water to bubble,

or effervesce, as the gas escapes. The soda water used in soda fountains is stored in metal tanks under high pressure. It is drawn off and mixed with flavorings to make soft drinks and ice-cream sodas. Soda water was first produced in 1772 by Joseph Priestly of England. He was trying to imitate the natural bubbling waters of some mineral springs. Soda water was introduced into the United States by a Philadelphia physician in 1807. At that time, soda was used to prepare the carbon dioxide for charging the water. The soda fountain was exhibited at the Paris Exposition in 1867. But soda water was little known in England until about 1908, when an American, Harry G. Selfridge, established a great department store in London

and invested a large sum in a modern soda fountain.

Most soft drinks are bottled. In the United States, more than two billion bottles of soft drinks are drunk every year. The soft-drink industry ranks twenty-first among the industries of the United States, and the value of its products totals more than \$360,000,000 a year.

L.R.C.

**SOFT MONEY.** See MONEY (Unusual Terms Applied to Money).

**SOFT-SHELLED CRAB.** At one stage in the life cycle of certain crabs, the "soft-shelled" crab is valued as a delicacy.

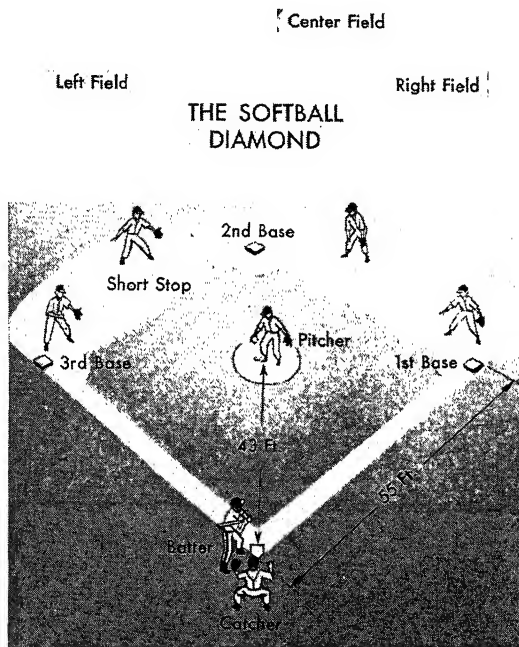
**SOFTWOOD.** See TREE (Kinds of Trees).

**SOGDIANA, SAHG dih A nah.** See ALEXANDER THE GREAT (Conquest of the World).

**SOGLOW, OTTO.** See CARTOON (Leading Cartoonists).

**SOIL** is made up of broken bits of rock mixed with the remains of living things. A geologist might consider all the covering of the earth as soil. The farmer, however, thinks of soil as only that part of the earth's covering which can be used for growing crops or pasture grasses.

Soil is one of the most important natural resources of any country. That is why great efforts are being made



to conserve the soil. When the soil becomes unable to grow good crops, not enough food can be produced to feed the people, and the strength of the nation declines.

### How Soil Is Made

It takes a long time for soil to form. Scientists think that it took about five hundred years to form an inch of some of the topsoil in Missouri. In other places, scientists estimate that it took at least six hundred years for an inch of soil to be made. This means that in places where the topsoil is six or seven inches thick, it required at least 3,600 years of natural processes for the layer of topsoil to be laid down. Various types of soil form at different rates. Clay soils take the longest because they are ground into such tiny bits of rock.

Soil may be formed in one of two general ways. It may be formed on the spot from the layer of rocks below the soil. Gradually these rocks will be broken finer and finer until they form topsoil. On the other hand, soil may be brought in by the action of winds and water, and dropped in a new place. Soil brought in by rivers and streams is called *alluvium*. Soil moved by glaciers is called *till*. Fine soil, blown about by the wind before it is deposited, is called *loess*.

**Work of the Air.** Air helps to make soil because it contains oxygen. The oxygen of the air combines with the chemical elements in rocks, causing them to decay. Moving air, or wind, helps to make soil when it blows sand against rock and causes it to wear away.

**Water.** Running water alone can wear away hard rock. Nearly all running water carries sand or gravel with it and these particles also help to wear away the rock. Rain and snow also help break rocks into small pieces. When water freezes in cracks in the rocks, it expands and causes the rock to break off into smaller pieces. The constant process of freezing and thawing of the water on the surface of rocks helps to wear away the

rock and make soil. This process is called *weathering*. The oxygen which water contains, like the oxygen in the air, combines chemically with the substances which have been dissolved from the rocks. Glaciers do their part in making soil by scraping up loose rocks from the surface of the earth, carrying them along, and grinding them down. When the ice of the glacier is melted, the soil remains behind.

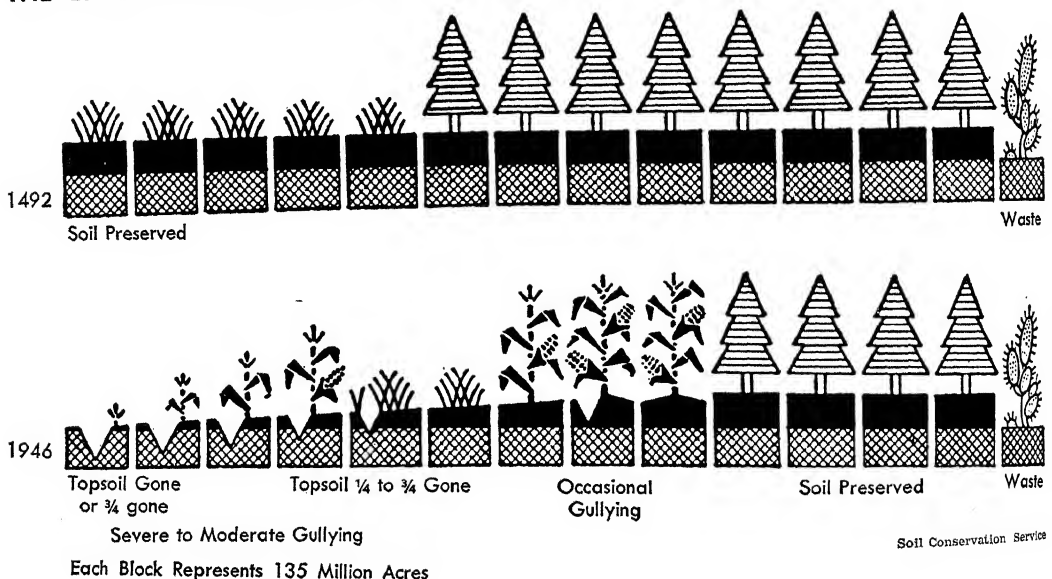
**Plants** increase the value of the soil in two ways. They send their roots through the soil, which tends to break it up and make it better for growing things. When plants die, the bodies of those plants are returned to the soil, and decay to form humus. The roots of plants, even though very small, are very strong. They have been known to split hard rocks. Small plants called bacteria help the green plants in the process of decay.

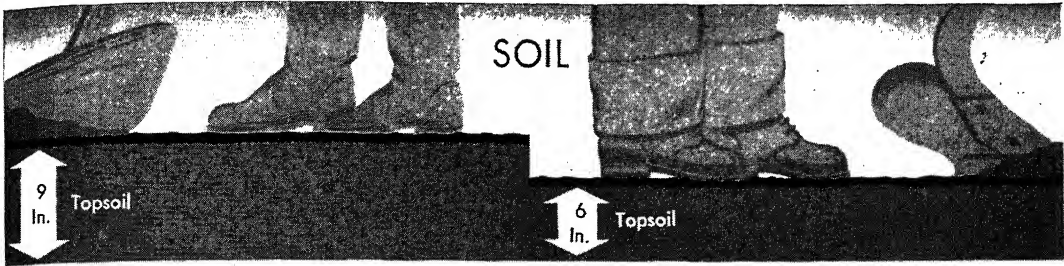
**Animals.** Animals also help to keep the soil fertile. The body wastes of many animals enrich the soil. When an animal dies, its body decays and adds richness to the soil. Animals that burrow beneath the surface help to mix the soil. Perhaps the most valuable of all these animals are the earthworms. Charles Darwin first noticed the value of earthworms in the improvement of the soil. In order to obtain food, earthworms take soil into their bodies and pass it out again in a finely pulverized state.

### How Soil Is Destroyed

Almost half of the cultivated ground in the United States has been ruined, more or less seriously, by soil erosion. It takes hundreds of years to build up an inch of topsoil, but all the topsoil on a farm can be washed away by rains in less than twenty years. When the first colonists came to North America, they found a continent with very rich soil. The early settlers along the eastern seaboard quickly exhausted their soil by not fertilizing it and by failing to prevent the erosion of the soil. Much rich farm land was ruined in this way.

## THE EXTENT OF EROSION IN THE UNITED STATES





1700's

When the U. S. was still largely an uncultivated wilderness, topsoil was nine inches deep.

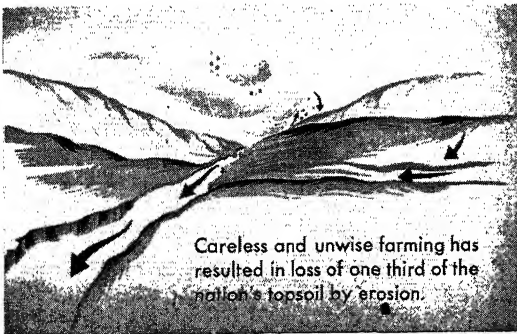
1900's

Today—200 years later—the topsoil cover is only six inches thick—a loss of one third.

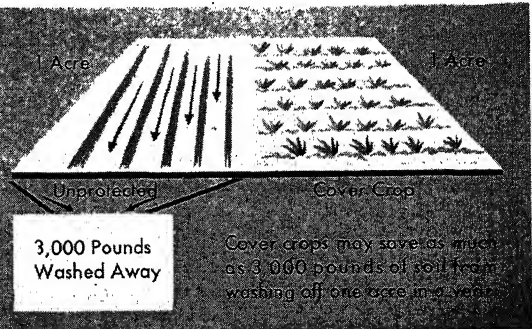
Tilled Field



Water and wind have eroded  $1\frac{1}{2}$  feet of rich topsoil from the plowed land that surrounds the untilled plot, strongly protected by grass, at the right.



Careless and unwise farming has resulted in loss of one third of the nation's topsoil by erosion.



The pioneers pushed westward across the continent, leaving worn-out soils behind them. When they cut down the trees to clear the land for farms, they increased the amount of soil that the rain water carried away.

The power of the pelting rains began to cut small gullies on farms. These gullies gradually got larger with every rain until they made the land completely useless. Rain not only washes away the soil itself, but it may also dissolve the important chemicals in the soil and carry them away. Scientists believe that almost six times as much of the plant food is washed away by rain as is taken out of the soil by growing crops.

Water is not the only destroyer of soil through erosion. During World War I and immediately following, many acres of grasslands were plowed up and sowed with wheat because of the high price of wheat on the world market. When these acres lost the covering of grass that had protected them, the wind swept up the topsoil and carried it away. The dust storms of the middle 1930's ruined many farm lands in the Middle West. Pasturing cattle and sheep on land also helps to cut down the vegetation and increase erosion.

Various methods were used to prevent further erosion. Trees were planted along a shelter belt in the

Middle West to check wind erosion. Farmers planted crops such as kudzu and lespedeza in their fields in order to keep the rain from washing away the soil. Terraces were made on hillsides. Contour plowing, in which the plow runs across the slope of the land instead of with it, was adopted to keep the water from running off the field too quickly.

Soil erosion has been an important problem in past civilization. Palestine was once a fertile country, but erosion has washed off all the soil until much of it is barren. Similar erosion took place in Greece and North Africa.

### Characteristics of Soil

To the farmer, the soil has four important characteristics. These are its depth, its structure, its texture, and the chemical elements which are found in it.

**Depth.** The topsoil, which is the essential part of the soil for agriculture, very seldom lies deeper than the depth of a spade over any part of the earth's surface. The topsoil is generally deeper in valleys than on slopes or near the tops of hills and mountains. Below the topsoil is another layer which may be two or three feet deep, called the subsoil. This is soil in the process of

being made. Below the subsoil usually lies solid rock.

**Texture.** The texture of the soil depends entirely upon the size of the grains or particles which make it up. The largest particles are the pebbles and small rocks that are found in the kind of soil called gravel. The smallest particles are found in clay soil. In between are the particles making up silt and sand. The particles of sand are large enough to be gritty to the fingers. The particles of silt are just about large enough to be seen. Any decayed animal or plant matter found in the soil is called humus.

Most soils are not pure sand, or clay, or silt. They are mixtures of the various particles found in the soil. Such mixtures are called *loam*. In order to be considered a sandy soil, the soil must be at least half sand. In order to be considered clay soil, the soil must be at least half clay. Clay soils are usually considered heavy. Sandy soils are considered light.

The texture of the soil often helps to determine its fertility. Sandy soil, for example, is not good for growing plants, because it does not hold water well. On the other hand, a clay soil does not let enough air reach the roots of the plants. A fine loam, with a large amount of silt and humus, is usually considered to be the best kind of soil. The soil requirements of many different kinds of plants may vary, however.

**Structure.** The structure of the soil is important, because it shows how well the various grains which make up the soil cling together. In the ideal soil, each grain is not entirely separate, but tends to form small crumbs with the other grains. This is one reason why humus is valuable in the soil, because it tends to help the particles to cling together.

**Chemical Make-up.** Plants receive much of their necessary food from the soil. For this reason it is necessary that the chemicals which provide these foods be found in the soil. If these foods do not exist in the soil, they must be added by means of fertilizers. Sodium, potassium, calcium, phosphorus, magnesium, iron, and chlorine are essential for the growth of all living substances. Therefore, these chemicals all must be found in the soil. If one crop takes out too much of these sub-

stances from the soil, the farmer must be sure to replace them. But most soils contain enough of some of these substances, for example, iron, so that they need not be replaced. Phosphorus, the nitrates which contain nitrogen, and calcium must often be replaced. Soils may contain too much acid. In this case the farmer adds lime to the soil to make it more alkaline.

The chemical composition of the soil also influences the health of the animals which eat the plants growing on a special kind of soil. For example, in some Western states the soil contains much selenium. The plants are able to use the selenium without much harm, but if an animal eats a plant grown in this kind of soil it becomes diseased. The amounts of iron may also differ. Plants grown in some areas may contain much more iron than plants from others. The people who eat the plants which are grown on the best soils tend to be healthier than those who eat plants grown on poor soils.

**Kinds of Soil.** Scientists who specialize in the study of soil are called *pedologists*. They have developed various ways of classifying soil, in addition to those which are based upon the size of the particles which make up the soil. Much of the work on this kind of soil classification has been done in the Soviet Union, where the scientists have made elaborate studies of the soil. The amount of lime contained in the soil is one of the major ways of classifying all soils. Soils which do not accumulate lime are called *pedalfers*. They are usually found in areas where the rainfall is plentiful. Soils in which lime accumulates are called *pedocals*, and are found in places where there is little rainfall. The soil in the eastern half of the United States, for example, is largely made up of pedalfers. That in the western half, with the exception of a strip along the northwestern Pacific Coast region, is made up of pedocals. Within these two groups there are further classifications. Among the richest soils are the so-called *blackerths*, or the *chernozem* soils. They are found along the eastern edge of the Great Plains of the United States, and cover parts of southern Soviet Russia. The soils are black or dark brown in color, and contain a large amount of humus. The Corn Belt soils of the United States are classed as *prairyerths*. Here the topsoil is very deep. These soils are also blackish in color. The prairyerths are pedalfers, while the blackerths are pedocals. On the whole, the pedalfers are less suitable for farming than are the pedocals, but because the pedalfers occur in the regions in which there is more rainfall, they are widely used in farming.

**Related Subjects.** The reader is also referred to:

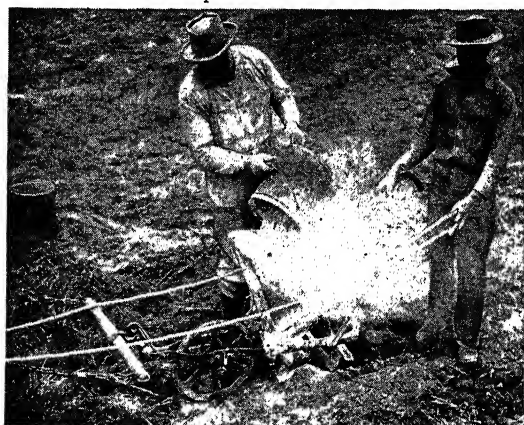
Agronomy	Erosion
Alkali	Fertilizer
Clay	Gardening (The Garden Soil)
Conservation (Soil Conservation)	Humus
Drainage	Irrigation
Dust Bowl	Loam
Dust Storm	Loess
Earthworm	Rotation of Crops
	Topsoil

#### Questions

What is soil?

Why is soil important to man?

How long may it take for an inch of soil to be formed?



Soil Conservation Service

**Adding Chemicals to Soil** produces a sturdy crop and keeps the ground healthy for the next planting. The farmer is pouring lime into a spreader. If the soil has too much acid, lime must be added before planting crops.

How much of the topsoil of the United States has been seriously damaged by erosion?

What are the methods of preventing erosion?

What is the best kind of soil for plants?

**SOIL CONSERVATION.** See CONSERVATION (Soil Conservation); EROSION.

**SOIL CONSERVATION ACT.** See ROOSEVELT, FRANKLIN D. (1936 Legislation).

**SOIL CONSERVATION SERVICE.** See AGRICULTURE, DEPARTMENT OF.

**SOILLESS AGRICULTURE.** See HYDROPONICS.

**SOILS, BUREAU OF.** See AGRICULTURE, DEPARTMENT OF.

**SOKOL, SO kohl.** See CZECHOSLOVAKIA (Recreation).

**SOKOLOV, suh kuh LAWF, NAHUM** (1861-1936), was an author and Zionist leader. He was an outstanding Hebrew writer in his time, and was known as the founder of modern Hebrew journalism. Sokolow was born in Wyszogrod, Poland. In 1884 he became editor of the Hebrew newspaper *Hatzefirah*. In 1931 he was elected president of the World Zionist organization, whose publication he founded and edited. I.J.R.

His Works include *History of Zionism, 1600-1916*; *Sinath Olam le-Am Olan*, a history of anti-Semitism; *Tzaddik Venisgab*, a historical novel; and *Eretz Hemdah*, a geography of Palestine.

**SOL, sahl.** See CALENDAR (Thirteen Month Calendar).

**SOL, sohl**, is a standard silver coin used in Peru. In normal times, it has a value of about forty-seven cents in United States money. The sol is named for the radiant sun pictured on the coin. It is also the name of an old French coin that is no longer used. J.CoF.

**SOLANACEAE, sohl ah NA see ee.** See NIGHTSHADE.

**SOLANUM, soh LA num**, is the name of the most important group of plants in the nightshade family. More than 500 different kinds of herbs and shrubs are included in the group. They grow in many parts of the world, but are especially abundant in tropical America.

The most common and important species of solanum is the *potato*. Another is the *eggplant*. A few of the other well-known species of the temperate regions are *bittersweet* and *common nightshade*. These grow in many parts of America and Europe. The *horse nettle* and other spiny troublesome weeds are native to the United States. Several species were used long ago as medicine, and are still used by the Chinese. The fruits of many East Indian varieties are eaten. One species, called *kangaroo apple*, is a common kind of food in Australia and New Zealand. P.C.S.

**Classification.** The genus *Solanum* belongs to the family *Solanaceae*.

**Related Subjects.** The reader is also referred to:

Bittersweet	Nightshade
Eggplant	Painted-Tongue
Flowering Tobacco	Potato

**SOLAR DAY.** See DAY.

**SOLAR ENGINE, or SUN MOTOR.** A solar engine is a machine for changing the heat of the sun into motion. Scientists have found that each square yard of the sun's surface gives off 70,000 horsepower of energy per second. The portion of this energy that reaches the earth is two horsepower, which adds up to 70 mile-tons per square foot per year. A mile-ton is the amount of energy needed to move a ton a distance of a mile.

John Ericsson, who built the warship *Monitor* in the

War between the States, also made several solar engines that worked. His best engine had a reflector 18 feet across. The rays from the reflector focused on a tubular six-inch boiler. This engine delivered 4 horsepower continually when the sun was shining.

A solar motor built at Pasadena, Calif., in 1901, was the most successful up to that time. It had a huge mirror shaped like an umbrella. It measured 36 feet 6 inches across the widest end, and tapered to 15 feet at the bottom. This disk contained 1,788 small mirrors arranged to focus the sun's rays on a boiler. The boiler held 100 gallons of water, and had space for 8 cubic feet of steam. This steam power could pump 1,400 gallons of water a minute. The mirror was also connected with clockwork that kept it turned toward the sun.

Charles G. Abbot of the Smithsonian Institution built his fifth solar engine in 1936. It had aluminum mirrors, and turned 15 per cent of the solar energy it received into useful work. His solar engine was about half as efficient as the best modern oil engine, and about three times as efficient as an ordinary coal-burning locomotive. The inventor claimed it could turn water to steam almost instantly.

Though these and other engines worked, there are experts who think solar engines are not practical. One objection is that they will not work at night or on cloudy days. The development of the Diesel engine and the cheapness of gasoline and oil may have made other sources of power seem worthless. But storage batteries can be used to store up power from the solar engine to use when it is not running. A good sun engine can hold its own with a small hydroelectric plant, and is far superior to a windmill. E.A.FE.

**SOLAR HEATING.** See SHELTER (Modern Ideas about Shelter; illustration, The Solar House).

**SOLAR PLEXUS.** The solar plexus is a large network of nerves back of the stomach. It is sometimes called the *abdominal brain*, for it is the control center of the sympathetic nervous system that sends branches to and controls all the abdominal viscera. Its nerve threads connect by numerous branches with the organs of the abdominal cavity.

A blow on a spot between the navel and breastbone, a little to the right, is called the solar plexus punch. A fighter can be knocked out by this punch if it is hard enough. It paralyzes the solar plexus and brings on unconsciousness. The solar plexus first became well known in 1897 as a result of the championship boxing match between James Corbett and Robert Fitzsimmons. Fitzsimmons knocked out the clever boxer Corbett with a blow to the solar plexus. See also NERVOUS SYSTEM (Autonomous Nervous System). A.B.H.

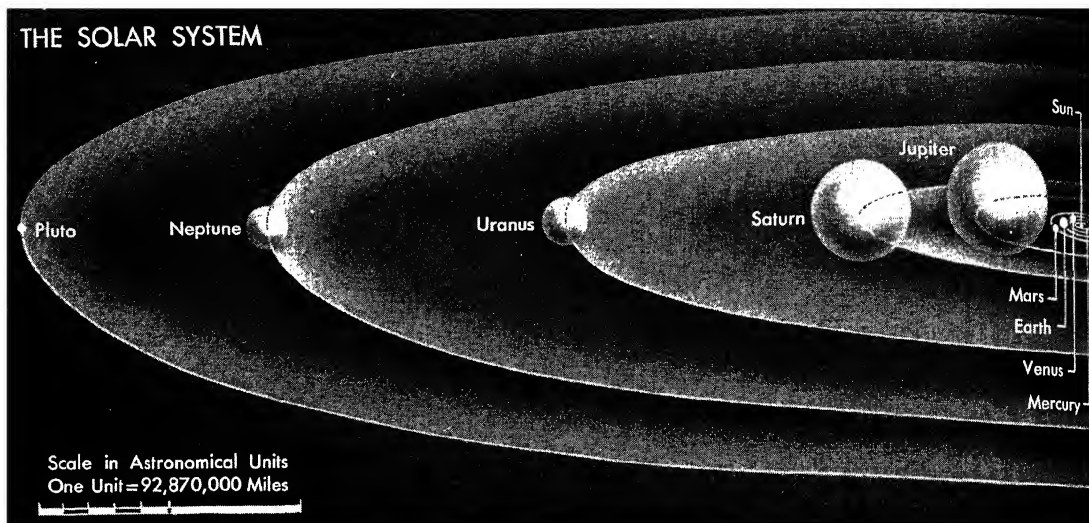
**SOLAR SPECTRUM.** See LIGHT (color plate, Spectrum Analysis); SPECTRUM AND SPECTRUM ANALYSIS.

**SOLAR SYSTEM.** The solar system is made up of our sun, the planets, and the other heavenly bodies which revolve about the sun. The name "solar" comes from several ancient words for sun which all sound something like "sol."

There are many heavenly bodies in our solar system. These include the planets, their satellites or moons, the asteroids, and countless swarms of meteors. These are all held in their places by the pull of the sun. They



## THE SOLAR SYSTEM



**Comparative Sizes of the Nine Planets** of the solar system are shown here. The white circular lines are the orbits. The sun

travel round and round the sun, receiving and reflecting light and heat. There are also diffuse bodies called comets, which revolve in highly elliptical orbits and develop tails when they are near the sun.

The nine large planets are the most massive bodies in the solar system, next to the sun. These planets have twenty-eight satellites, including our moon. There are thousands of smaller asteroids. The meteors are so small that they cannot be seen until they come within the earth's atmosphere and burn up. Then they become brilliant and are seen as shooting stars.

Each of these bodies has a regular path, or *orbit*, around the sun. None of the orbits is a perfect circle. The paths are flattened circles, or *ellipses*. When a scientist says that a planet is a certain distance from the sun, he means the average distance of its ellipse from the sun.

In 1772 a German scientist named Johann Elert Bode originated an easy way to remember the distances of the planets from the sun. It was then called Bode's law, and it still applies fairly closely, although it is no longer considered a law.

Bode selected the number 3, and doubled it, getting 3, 6, 12, 24, 48, 96, and so on. Then, starting with the sun, which represented zero, he added four to each number to get the tens of millions of miles from the sun. The following table shows how closely his figures came to the distance of the planets known in his day.

PLANET	TENS OF MILLIONS OF MILES FROM THE SUN	BODE'S NUMBERS
Mercury	3.59	4( 0+4)
Venus	6.72	7( 3+4)
Earth	9.29	10( 6+4)
Mars	14.15	16(12+4)
Jupiter	48.33	52(48+4)
Saturn	88.6	100(96+4)

We can see from this table that Bode was remarkably accurate, but the law does not hold for all the planets and asteroids which were not known in his day, as the following table shows.

is indicated only by a point. Actually, it has a diameter ten times that of Jupiter, largest of the sun's satellites.

	TENS OF MILLIONS OF MILES FROM THE SUN	BODE'S NUMBERS
Asteroid Eros	13.55	
Asteroid Ceres	25.7	28(24+4)
Uranus	178.19	196(96×2,+4)
Neptune	279.35	
Pluto	336.50	388(192×2,+4)

**Related Subjects:** The reader is also referred to:

Aristarchus	Midnight Sun
Asteroid	Nebular Hypothesis
Comet	Planet
Copernicus	Planetesimal Hypothesis
Gravitation	Satellite
Meteor	Sun

**SOLDER**, *SAHD er*, is a metal alloy which is used for joining metal surfaces together. It is also used in mending metal objects. To be effective, the solder must melt more easily than the metals to which it is applied.

There are two types of solder, hard and soft. Hard solders will melt only at very high temperatures. The advantage of hard solders is that they are very strong and can be pressed or hammered into various shapes without breaking. Some hard solders are drawn out into long threads and others are pressed into sheets. The most common hard solder is silver solder, which consists of silver, copper, and zinc. Other commonly used solders are brasses, which are made up mainly of copper and zinc. Many copper alloys are also used as hard solders.

Soft solders will melt at low temperatures. But they are very brittle and cannot be hammered without breaking. The most common soft solders are various alloys which consist mainly of tin and lead. These alloys also contain other metals such as antimony, cadmium, bismuth, and silver.

All surfaces to be soldered must be free from any dirt, grease, or oxide.

A.E.Ad.

See also **ALLOY**.

**SOLDIER**. See **ARMY**; also list under **Military Leaders** in the **BIOGRAPHY** section of the **READING AND STUDY GUIDE**.

**SOLDIERS' BONUS.** In ancient times, soldiers shared in the booty of wars. The commander who was most generous in allowing his soldiers to plunder the goods of defeated peoples had the most followers. The Roman emperors often gave land grants to war veterans. In later times, when the great size of armies made booty and land grants impractical, discharged soldiers were frequently given bounties, or bonuses. As it is discussed here, the soldiers' bonus is a grant apart from pensions. See PENSION (Military Pensions).

After the Revolutionary War, officers in the United States Army were granted five years' pay as a bonus for their service. Noncommissioned officers and privates were given a flat sum. A small cash bonus was given to veterans of the Union Army after the War between the States. Spanish-American War veterans were not granted a bonus, and the idea was almost forgotten for many years.

After World War I, veterans asked a bonus on the ground that soldiers were not paid what they could have earned if they had remained at home. Veterans' organizations were strong enough to get Congress to adopt a bonus bill in 1922 based on this new idea, called "adjusted compensation." President Harding vetoed the bill. President Coolidge vetoed it again in 1923, but Congress passed the bill over his veto, and it became law on May 19, 1924. The bill provided a dollar a day for service in the United States and a dollar and a quarter for each day overseas. Payment was put off until 1945 by the issuing of interest-bearing certificates. In 1931, because of the hardships brought on by the economic depression, veterans pressed for a 50-per cent advance loan on their adjusted compensation certificates. Congress passed a bill for partial payment over President Hoover's veto. This gave rise to a demand for payment of the bonus at once in full. The bill passed the House in 1932, but failed in the Senate. A "bonus army" of about 15,000 veterans marched into Washington. They were ordered to disband and go home. Rioting developed, and several members of the bonus army were injured in fights with Washington police and United States troops. Congress finally adopted a bill calling for cash payment of the bonus in January, 1936, over President Roosevelt's veto. Twenty-two states also paid bonuses to veterans.

The Veterans of Foreign Wars was the first veterans' group to press for a cash bonus after World War II. Among many veterans strong sentiment for the bonus was increased by the growing problems of returning more than ten million men to civil life. In 1946 Illinois and New York became the first states to pass bonus bills for their returning soldiers.

G.W.Ml.

See also G.I. BILL OF RIGHTS.

**SOLDIER'S HEART** is a weakness of the heart and circulation found mostly in soldiers who are actively fighting or marching. It is due to overstrain. This ailment is also known as irritable heart, and disordered action of the heart (abbreviated as D.A.H.). Symptoms are shortness of breath, pains in the chest, rapid pulse, and giddiness. The person also tires easily. The condition is sometimes found in civilians.

P.R.C.

**SOLDIERS' HOMES.** The first United States Soldiers' Home was established in Washington on March 3, 1851. Its purpose was to make a home for invalid and disabled

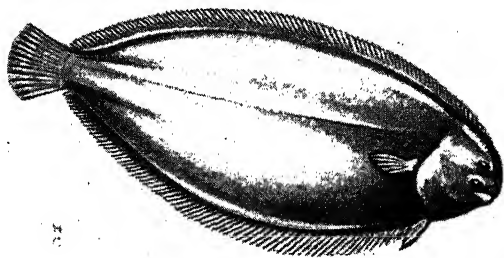
soldiers. After the War between the States, three Federal soldiers' homes were established under an act of Congress in March, 1865. A Confederate Soldiers' Home was founded at Little Rock, Ark., in 1891. It was taken over by the state of Arkansas in 1893. The Maryland Line Confederate Soldiers' Home, founded at Pikesville, Md., in 1888, was closed in 1932.

Eight more soldiers' homes were added after 1865. The Veteran's Administration now directs soldiers' homes at Bath, N.Y.; Bay Pines, Fla.; Biloxi, Miss.; Boise, Ida.; Dayton, Ohio; Fort Washington, Md.; Hot Springs, S.D.; Kecoughtan, Va.; Los Angeles, Calif.; Mountain Home, Tenn.; Whipple, Ariz.; and Wood, Wis.

**SOLDIER'S MEDAL.** See DECORATIONS AND MEDALS (Decorations of the United States).

**SOLE** is the name of a family of flatfishes which have twisted skulls so that both eyes are on the same side of the body. Soles live in warm seas near shore, making their homes on sandy or muddy bottoms. Their eyes are small and set close together. The mouth is crooked, and the body is a flattened oval, shaped somewhat like the sole of the human foot.

The *European sole* grows from ten to twenty inches long, and usually weighs about a pound. The *common American sole*, also called *hogchoker*, lives along the eastern coast of North America. It sometimes goes up rivers



The European Sole Is a Famed Food Delicacy

for some distance. This sole is often used as food. The European species also is a favorite food, because its flesh is firm and white and has a good flavor.

Some kinds of flounder that live along seacoasts are also called soles.

L.P.Sc.

See also FLOUNDER.

**Classification.** The American sole is *Achirus fasciatus*. The European is *Solea vulgaris*. They are in the family *Soleidae*.

**SOLEMN LEAGUE AND COVENANT.** See COVENANTER.

**SOLENOIDON**, *soh LE noh dahn*, is the name of a group of strange animals which eat insects. They are about two feet long and have long snouts.

**SOLENOID**, *SO lee noyd*. A solenoid is a hollow electric coil which, when activated by a direct current, will pull a magnetic plunger into the coil. Solenoids are used where it is desired to convert an electric impulse into a pushing or pulling action. Solenoids are part of the equipment in mechanical sorting and grading devices, and form the heart of the operation of many forms of relays, contactors, and circuit breakers. One example of

the use of a solenoid is as follows: A conveyor belt carries fruit, or cans, or colored bottles, or whatever is to be sorted. At a certain place a photoelectric cell, or "electric eye," scans the objects on the belt. The "eye" has been set to a given standard of light. When the color combination entering the "eye" is of this standard, nothing happens. Should a different color combination appear, or a different intensity of light, the photoelectric cell's balance is broken, a current is sent through a relay, the relay armature closes and operates the solenoid circuit. The solenoid armature plunges into the coil. This activates a lever that flashes a mechanism out and knocks the offending article off the conveyor belt. This whole action takes place many times faster than you can read these words. It is startling to see how unerringly an electric eye-solenoid outfit can spot an offending object on the belt.

Solenoids have many other uses in modern automatic machinery. P.H.C.

**SOLFATARA**, *sohl fah TAH rah*. See VOLCANO.

**SOLICITOR**. See BARRISTER.

**SOLICITOR GENERAL**. See COURT (Federal Courts); JUSTICE, DEPARTMENT OF.

**SOLID**, in mathematics, is a term used to describe a geometric figure with the three dimensions of length, breadth, and thickness. There are many kinds of solids. Each one takes its name from the shape of the surfaces that bound it. For example, solids are cubes, spheres, cones, and cylinders.

In physics, a body is said to be *solid*, *liquid*, or *gaseous*. Each body is named according to the power of its molecules to resist outside forces which would tend to change its shape. H.C.B.

**Related Subjects.** The reader is also referred to:

Cone	Gas	Prism
Cube	Liquid	Pyramid
Cylinder	Mensuration	Sphere

**SOLID GEOMETRY**. See GEOMETRY (Elementary Geometry).

**SOLID MEASURE**. See CUBIC MEASURE.

**SOLID SOUTH**. The bitter feelings aroused by the War between the States and the Reconstruction period caused many Southerners to feel that the Republican party opposed most Southern principles. As a result the Democratic party came to control most of the local government in the South, and to command overwhelming majorities of the Southern vote in national elections. Because of this almost solid Democratic control, the Southern States came to be called the "Solid South."

**SOLIS**, *soh LEES*, **JUAN DIAZ DE** (1470-?1516). See RIO DE LA PLATA; URUGUAY.

**SOLITAIRE**, *SAHL ih TAIR*, is the name given to many card games that are played by one person alone. All fifty-two cards in the pack are used. The object is to arrange the cards in suits and build up or down in sequence according to certain rules. Interest lies in the player's success in working out different combinations. Some games of solitaire need the exercise of skill and judgment. Most of them are games of chance, and the player is unable to change the result after the cards have been shuffled and cut. There are hundreds of solitaire games. Under the name of *patience* they have been played for hundreds of years. J.S.ME.

**SOLITARY BEE**. See BEE (Kinds of Bees; Kinds of Solitary Bees).

**SOLITARY INSECT**. See BEE (Solitary Bee; Kinds of Solitary Bees); INSECT (Insects and Other Animals and Plants); WASP (Solitary Wasps).

**SOLOGUB**, *soh loh GOOB*, **THEODORE TETERNIKOV** (1863-1927). See RUSSIAN LITERATURE (Nineteenth Century).

**SOLOMON** was the son of David. He succeeded David as king of all Israel. Solomon ruled until he died in 931 B.C. It is not known when he came to the throne, but the Bible uses the round number forty years when speaking of the length of his reign. When the aged David lay on his deathbed, there were several besides Solomon who had a claim to the throne. But his mother, Bathsheba, and others of the court successfully plotted to give Solomon the throne. The man who wrote the Biblical story of the plot seems to have sided with Solomon, so we do not know how wicked the plot may have been. But we do know that the new king began his reign by ordering the deaths of all those who had opposed him.

**As a Businessman**, Solomon added much to the wealth David had left. He brought fine horses from other lands into his country, and sold them for high prices. Only the king and his friends were allowed to engage in the horse trade.

Solomon also built up a fleet of trading vessels that sailed from the head of the Gulf of Akabah down the Red Sea to the land of Ophir. With southern Arabia, also, he built up a prosperous trade. The Queen of Sheba, who came from a region in southern Arabia, once visited Solomon's court. We still read stories about that visit. In the land of Edom, Solomon mined rich copper and iron, which were carried down the valley and smelted at Akabah. It is small wonder that the Biblical historian exclaimed, "So King Solomon exceeded all the kings of the earth in riches . . . And the king made silver to be in Jerusalem as stones." (I Kings 10:23, 27).

**As a Builder**, Solomon transformed Jerusalem from a lowly city into a great capital. David's reign had been stormy. Solomon's reign was quite the opposite. The country was peaceful. There was time for the pursuits of art and literature and building. Solomon put to good use the wealth that was gained in trade. He began a great building program. The most famous building raised at that time was Solomon's Temple. This was the first temple Israel had had since the small shrine at Shiloh was destroyed by the Philistines about a hundred years before.

Even larger and finer than the Temple was Solomon's own palace and the gorgeous palace he built for his queen, a former Egyptian princess. The king also built a huge audience hall. It was called "The House of the Forest of Lebanon" because its pillars were as numerous as trees. Besides the public buildings, many grand homes and halls were erected by the rich members of the court. Jerusalem became almost a different city.

The Bible tells how, as a wise man, Solomon was known throughout the Eastern world. It is true that he was interested in all the branches of culture and learning. He assembled at his court a group of the finest scholars and writers of the time. Many fables are told about the wisdom of Solomon. It is quite possible that



Brown Bros.

**King Solomon Receiving the Queen of Sheba** at his palace in Jerusalem. She gave him gifts of rare spices, precious stones, and 120 talents of gold worth about \$3,490,200.

Solomon himself took part in the discussions of the learned men at court. At any rate, he supported them and gave them his personal interest.

Solomon was formerly thought to have written the Biblical books of Proverbs and Ecclesiastes and the Song of Solomon. But modern scholars do not believe this, although some of his work may be in the Book of Proverbs. Solomon's reign was a time of wealth and splendor, such that the early Hebrew historians were dazzled by all this wealth.

**As a Ruler,** Solomon failed. He knew how to handle other countries, but did not know how to treat his own people. His court was magnificent, but it was expensive. By no means did Solomon's personal wealth pay all the expenses of the court. It had to be supported by the little people in the kingdom—the farmers and shepherds and craftsmen.

Taxes were heavy in every state except the king's native Judah. And still worse, many poor people were used like slave labor to construct the great public buildings and palaces. The people were not contented. During Solomon's reign Edom and Damascus revolted. The northern tribes grew restless. A foreman of a gang of workers, named Jeroboam, spoke up against the government and was forced to flee for his life.

When Solomon died, his son Rehoboam came to the throne. The new king tried to rule the people as sternly as his father did. It was then that the angry people rose up. The northern tribes broke away from Israel. The kingdom was split up into separate states, and never again was Israel united under a single rule. The division

of the kingdom ended Israel's political leadership in the ancient world. In time the people became known for their literary and religious expression. But Solomon's reign cost his people their place in world affairs. W.A.I.

See also **ARCHAEOLOGY (History)**; **DAVID**; **JERUSALEM**; **SONG OF SOLOMON**.

**SOLOMON, SONG OF.** See **SONG OF SOLOMON**.

**SOLOMON ISLANDS** are a group of islands in the southwestern Pacific Ocean. The Solomon Islands are part of the British Pacific Protectorate. The Solomon group is made up of Bougainville, Guadalcanal, Santa Isabel, Malaita, San Cristobal, Choiseul, New Georgia, Rennell, Vella Lavella, and a great many smaller islands. The group covers an area of 14,858 square miles, and has a population of about 94,000.

The climate of the Solomons is hot, damp, and unhealthful. The soil is fertile, but is not widely farmed. The islands are mountainous, heavily wooded, and well watered.

The natives are primitive Melanesians, much like African Negroes. Many of them, especially those in Malaita, were once cannibals and head-hunters. Most of the natives can speak some words of pidgin English.



Ewing Galloway

**A Native Drummer of the Solomon Islands** looks very fierce in his costume of feathers and animal teeth. These people were once head-hunters and cannibals. But friendly relations with missionaries and traders have partly civilized them. This native lives on one of the smaller islands.

The Solomons were discovered in 1567 by Álvaro Mendaña de Neyra of Spain. He named them in the belief that he had found the source of the gold that had been used for Solomon's Temple at Jerusalem. Later expeditions were unable to locate the islands. The English navigator Philip Carteret finally found them again in 1767.

Germany later held some of the islands, but began to cede them to other countries in 1889. Australia occupied the islands after World War I. The Japanese seized the Solomons early in 1942, and they became one of the most bitterly contested areas of World War II. United States troops finally took the islands from the Japanese after desperate fighting. E.E.Ei.

See also GUADALCANAL ISLAND; PACIFIC ISLANDS (map); RACES OF MAN (color plate); SANTA CRUZ ISLANDS.

**SOLOMON'S-SEAL** is the common name for a group of plants that have creeping roots and belong to the lily family. The roots spread out under the surface of the soil rather than growing straight down. Solomon's-seal grows in temperate regions of North America, Europe, and Asia. It is planted in wild gardens. It gets its name from the fact that the roots bear scars of growth that resemble the mystic seal of Solomon.

Solomon's-seal is a graceful plant. It has a long arching stem. The flowers are greenish and bell-shaped. The fruits are round and may be either blue or black.

Solomon's-seal grows best in shady places and rich soil. P.C.S.

See also PLANT (color plate, Some Members of the Lily Family).

**Classification.** Solomon's-seal is the common name for the genus *Polygonatum*. The European species is *P. multiflorum*, also known as *David's-harp*.

**SOLON**, *SO lahn* (about 639-559? B.C.), was one of the most famous lawmakers of all time. He was known as one of the "seven wise men of Greece."

Solon was born in Athens of a noble family. He was well educated and supported himself by foreign trade. Solon first became noted as a poet, and his poems played a great part in urging the Athenians to regain the island of Salamis, which had long been in foreign hands. He was given command of the forces sent to take back the island and rapidly made the conquest. Afterward Solon was elected archon of Athens and was given authority to change the laws.

Athens badly needed political and economic reforms. Most of the money was in the hands of a few powerful citizens. The small farmers had been forced to mortgage their lands and to borrow money with themselves and their families as security. In this way many farmers had become slaves. Solon immediately passed a law which canceled all these debts and mortgages, and freed those who had become slaves. Solon also changed the monetary system so that foreign trade was made easier. The only change he made in foreign trade was a law that grain could not be exported.

His constitutional reforms redivided the citizens into four classes, according to income. Citizens of all classes were allowed to become members of the assembly and the public law courts. Solon established a council of 400 to take over the political powers of the Areopagus, and

popular courts in which citizens could appeal the decisions of the officials. He kept the old provisions that allowed only the three higher classes to hold public office, and only the highest class to hold the archonship. These provisions continued the oligarchy, or rule by the few, but his reforms were a definite step toward democracy.

Afterward Solon is supposed to have made the Athenians promise to keep his laws for ten years, and he left the state for that length of time. When he returned, the country was fighting a civil war, and soon afterward, the tyrant Pisistratus seized control. Solon served for a time as his adviser and then retired from public life. C.B.W.

See also SEVEN WISE MEN OF GREECE.

**SOLSTICE**, *SAHL stis*. As the earth travels in its orbit around the sun, the sun seems to move. The earth is tilted about  $23\frac{1}{2}$  degrees on its axis, so that the sun does not always seem to be in the same position. During summer in the Northern Hemisphere, the northern half of the world is tilted toward the sun. During winter, the Northern Hemisphere is tilted away from the sun. The sun seems to rise very high in summer and much lower in winter. The solstice is the point at which the sun seems to start back in the opposite direction. The summer solstice comes on June 21. The sun seems to stand still for several days, and then start back toward the equator. It crosses the equator about September 23 and reaches the winter solstice about December 22. The summer solstice, June 21, is the longest period of daylight in the Northern Hemisphere, and the winter solstice, December 22, is the shortest period of daylight. See also EQUINOX. E.C.S.

**SOLUBLE GLASS.** See WATER GLASS.

**SOLUTION.** See GEOMETRY (A Problem of Construction).

**SOLUTION.** A solution is formed when the particles of a solid, a gas, or a liquid mingle with the particles of a fluid such as water so completely that a uniform liquid results. The fluid in which the substance is dissolved is called the *solvent*. The substance dissolved is the *solute*. The solution so formed is the result of a physical change in the substance involved, and not a chemical change. In case of a sugar solution, for example, the substance may be reconverted into sugar by evaporating the water. When any solvent has dissolved as much of a given substance as it can, the solution is said to be *saturated*. At the same time, it may not be saturated with respect to another substance, for a saturated salt solution will still dissolve sugar crystals.

When a solid changes to a liquid form, heat is absorbed. It is on this principle that freezing mixtures are based. When pounded ice and salt are mixed together and packed about an ice-cream receptacle, they change to liquid form. In so doing they absorb heat from the contents of the can.

At a given temperature, the solubility of a particular solid in a given liquid never varies. Its solubility may vary with different solvents. At ordinary temperatures, table salt dissolves about three times as freely in water as in alcohol. Grease cannot be dissolved in water, but it can be dissolved in gasoline. Most solids which dissolve in water are more soluble at higher temperatures. A few, like calcium sulfate, are less soluble in hot water than in



cold. Some very hard substances are slightly soluble. Flint glass, for example, used in making cut-glass utensils, dissolves somewhat in ammonia water. For this reason, the housewife should never clean her cut glass in water containing ammonia. When a gas dissolves in a liquid, there is a release of heat and a rise of temperature. The solubility of a gas in a liquid increases as the pressure increases, and decreases as the temperature increases.

G.L.Bu.

See also COLLOID.

**SOLVENT.** A solvent is a liquid which dissolves another substance into a mixture known as a *solution*. The substance that is being dissolved is called the *solute*. In a solution, the particles of the solute spread evenly throughout the solvent and cannot be seen. An example of this is the solution of sugar in water. *Water* is the most common solvent. It is very useful because it can dissolve many substances, such as sugar, salt, and alcohol. These substances are said to be *soluble* in water. But water cannot dissolve sulfur, sand, and fats. These substances are said to be *insoluble* in water.

There are many solvents which are used to dissolve various substances. These solvents are classified into groups according to the substances which are soluble in them. For example, *ether*, *carbon disulfide*, *carbon tetrachloride*, and *chloroform* are common solvents which are able to dissolve fats. For this reason, these solvents are used in removing grease spots from clothes and in dry cleaning. *Alcohol* is a solvent which dissolves shellac. This solution is used in the making of varnish. *Gasoline* is a solvent which dissolves tar and petroleum. There are numerous other solvents which are used commercially.

Some solvents dissolve substances without producing a chemical reaction. By that we mean that there is no actual union between the molecules of the solvent and the molecules of the solute. In most organic solvents, such as alcohol, ether, and carbon tetrachloride, there is no chemical reaction between the solvent and solute. This can sometimes be harmful. There is a chemical action, however, when acids dissolve metals, as the acids cause the metals to wear away.

G.L.Bu.

**Related Subjects.** The reader is also referred to:

Acetone	Chloroform
Alcohol	Furfural
Carbon Disulfide	Solution
Carbon Tetrachloride	

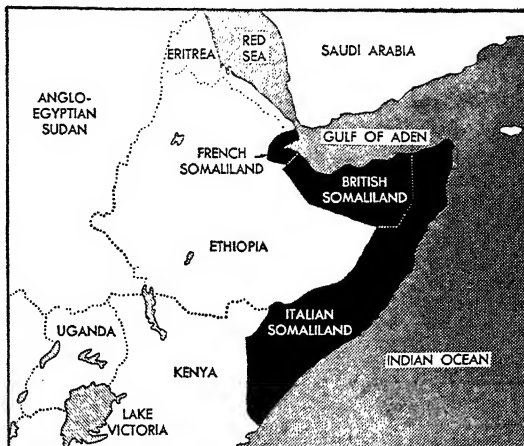
**SOLWAY FIRTH** is an inlet of the Irish Sea which lies between Scotland and County Cumberland, England. The firth is about thirty-five miles long, and it gets wider irregularly till it reaches a width of twenty miles. Solway Firth is particularly noted for its spring tide, which drives in as a tidal bore six feet high at the rate of ten miles an hour. The waters are shallow and stocked with fish, particularly salmon.

H.U.S.

**SOLYMAN**, *SAHL ih man*, a variant of SULEIMAN. See SULEIMAN I.

**SOMALILAND**, *soh MAH lee land*, is a region along the eastern coast of Africa. It borders the Gulf of Aden and the Indian Ocean. Somaliland is made up of French, British, and the former Italian-controlled Somaliland.

British Somaliland is a British protectorate, important chiefly because of its location. It covers an area of 68,000



Location Map of Somaliland

square miles, and has an estimated population of 700,000. A strip of coastal plain runs along the Gulf of Aden, but most of the country is a high plateau. There is little rainfall. The coast is very hot, but the inland plateau is cool and healthful. Most of the people are Moslems. They are wandering herdsmen of the Somali tribes, and live by raising cattle, sheep, and camels. Small crops are raised along the coast. The largest city is the port of Berbera, which is also the capital. (See BERBERA.) British Somaliland exports some animal hides, cattle, sheep, goats, gums, and resins.

The British government began its conquest of British Somaliland in 1884, after the Egyptians had left the region. In 1901 a religious leader, or Mahdi, known as the "Mad Mullah" led the Somalis in a revolt against the British. The British forces put down several outbreaks and finally withdrew to the coast. The Mahdi died in 1920. The British succeeded in regaining control over the whole country. Italian forces invaded British Somaliland in 1940, but they were driven back by British Imperial troops in 1941.

H.V.B.K., Jr.

See also AFRICA (map); FRENCH SOMALILAND; ITALIAN SOMALILAND.

**SOMBRERO**, *sahm BRAY roh*, a kind of hat. See DRESS (Latin America); MEXICO (illustration, Mexicans at Play).

**SOMERVELL, BREHON BURKE** (1892- ), commanded the Services of Supply of the United States Army during World War II. His determined and persistent tactics in demanding and getting priorities for the army on matériel led to occasional criticism of his methods. He was particularly attacked for backing the construction of the \$133,000,000 Canol oil pipe line in Canada. The line, built despite great opposition, carried less oil during the war than four tankers could have hauled. But the fact that the United States won the war largely because of its overwhelming superiority in supplies proved the practicality of Somervell's methods.

Somervell was born in Little Rock, Ark., and was graduated from the United States Military Academy in 1914. During World War I he served with the army engineers in France and continued with the engineers for a time after the war. In 1933 Somervell went to

Turkey where he made a special survey in preparation for a program of industrialization of the country.

In 1936 Somervell was named director of the Works Progress Administration in New York City. He held this difficult position until 1940 when he was called back into the army. Until 1941 he directed the army's program of construction and then took over command of the supply division. Somervell retired after World War II. F.S.M.



**Brehon Somervell**, American general who kept the army supplied in World War II

**SOMERVILLE**, Mass. (population 102,177). This residential suburb lies about two miles northwest of Boston, and is close to Medford and Cambridge, Mass. Industrial plants in Somerville include slaughtering and meat-packing plants, bakeries and confectionaries, foundries, machine shops, automobile assembly plants, and furniture factories.

A marker in Somerville indicates where Governor John Winthrop built a 36-ton vessel named *The Blessing of the Bay*. This ship was completed in 1631, and was probably the first vessel launched in Massachusetts. The site of Somerville was not settled until 1630. It was a part of the old colony of Charlestown until 1842, when it was chartered as a town. In the city there is a tablet which marks the spot where James Miller, aged sixty-five, was killed by the British while he was retreating from Concord and Lexington in 1775. "I am too old to run," he said. The first United States flag, with its thirteen stripes, was raised on Prospect Hill in Somerville in 1776. Somerville was chartered as a city in 1871. It began its industrial growth with the building of the Middlesex Canal through the city in 1803. W.F.D.

**SOMME, saum, RIVER.** Great battles of World Wars I and II were fought along this stream in northern France. The Somme River rises near the Belgian border, and follows a general westerly course for 140 miles to empty

into the English Channel. Ocean steamers enter the port of Saint Valery through the mouth of the Somme. A canal runs beside the Somme from Saint Valery past Amiens to Saint Quentin. From Saint Quentin, canals connect with the Oise and Scheldt rivers. W.R.McC.

**SOMNAMBULISM**, *sahm NAM byoo liz'm*. See SLEEP-WALKING.

**SOMNUS** was the god of sleep in Roman mythology. The Greeks called him Hypnos. He was the son of Erebus and Nox, the goddess of night. His brother was Mors, the god of death, whom the Greeks called Thanatos.

Somnus and Mors lived in a great cave at the end of a quiet valley. Clouds and shadows kept watch at the mouth of the cave, and poppies grew everywhere. The only sound was the gentle murmur of the drowsy river Lethe. The light was dim, and everything slept.

Somnus lay on a black couch in an inner room. He wore black plumes and slept behind black curtains. A crown of red poppies was on his head, and a glass of poppy juice in his tired hand. His son Morpheus, the god of dreams, smoothed his hair and guarded him while he slept. The forms of pleasant dreams floated about his couch, and dark nightmares hid in the corners. These dreams were sometimes sent out of the valley through the glittering ivory gates. They floated to the earth to warn mortals of dangers that were near.

The word *somnolent* means *drowsy* or *sleepy*, and comes from the name of Somnus. A person asleep is said to be *in the arms of Morpheus*. S.M.S.

See also MORPHEUS.

**SONATA, soh NAH tah**, is an instrumental composition with three or four movements with contrasts both in tempo and key, but related in thought. The usual four movement sonata begins with a brilliant *allegro*, and the second movement is slow, rhythmic, and lyrical (*andante*, *adagio*, or *largo*). The third movement is usually light and graceful, and may be in dance form, or a *scherzo*. The finale, or last movement, is in quick, bright tempo. Symphonies, string quartets, and long works for solo instruments use this sonata form. The first movement of the sonata is called the *sonata-allegro* form, and has three sections called the *exposition*, the *development*, and the *recapitulation*, which is almost a repetition of the exposition, though usually shorter. Beethoven's "Pathétique," "Waldstein," and "Appassionata" sonatas for piano are among the best of their kind. R.KEN.

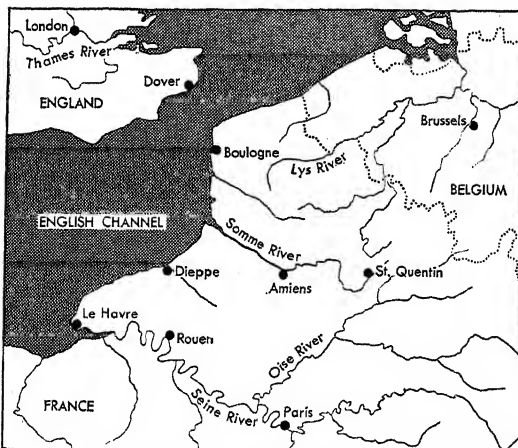
**SONGBIRD.** See BIRD (color plates, Common American Songbirds).

**SONG OF BIRDS.** See BIRD (Bird Songs); also names of many kinds of birds, for information on their songs. For example, BLACKBIRD; NIGHTINGALE; WARBLER.

**SONG OF DEBORAH.** See DEBORAH.

**SONG OF SOLOMON** is the name of a poetic book of the Old Testament. It tells of the love of a simple, countrylike couple in ancient Israel. The story is told in words of great beauty and charm. Some have thought that the poem is a drama. But this cannot be proved. The cast of characters includes King Solomon, the maiden or girl, her shepherd lover, and some others.

Some persons have thought that the book is a group of marriage songs. Others think that they were at first songs of the spring festival, and then they were changed to be



**Location Map of the Somme River**

suitable for a place in the Bible. No one knows who wrote them, or when. But however they began, everyone now admits that they are great love poems. The book is also called *The Song of Songs*, and *Canticles*.

The Jewish and Christian religions think the song is a story which teaches or explains something. The Jews think it pictures the close connection between God and Israel. The Christians think it suggests the union of Christ and the Church. W.A.I.

**SONG OF SONGS.** See SONG OF SOLOMON.

**SONG OF THE LARK.** See BRETON, JULES ADOLPHE (illustration).

**SONNET, SAHN et**, is a lyric poem of fourteen lines. In Italian its name means "little sound." The sonnet was at first recited to the music of the lute or mandolin. This poetic form was popular in the 1200's and 1300's in Italy and reached perfection in the sonnets of Petrarch.

The sonnet is more thoughtful and intellectual than a song. It comments on experience and may be deeply philosophical. In English there are two main forms of the sonnet. The Italian form was introduced into England early in the 1500's by Sir Thomas Wyatt and Henry Howard, Earl of Surrey. It is composed of two parts, the *octave* of eight lines and the *sestet* of six lines. The octave tells the theme, experience, emotion, or idea. The *sestet* comments on what has been set forth in the octave.

Variations in the rhyme scheme were developed in the English adaptation of the Italian form. The most successful poet in the English form of the sonnet was Shakespeare. Shakespeare's rhyme scheme, of three quatrains and a couplet, was *abab, cdcd, efef, gg*. The epigrammatic effect of Shakespeare's concluding couplet does not fit the desired effect of the Italian sonnet. The purest form of the Italian sonnet, using fewer rhymes, was *abba, abba, cdc, dcd*. Not all sonnets fall into the two groups. All kinds of rhyme schemes have been used both in octave and *sestet*. The sonnets of Keats, for example, are of a mixed type. Spenser, Milton, Donne, Shelley, Wordsworth, Elizabeth Barrett Browning, and Rossetti were other great English poets using the sonnet form. The last three usually used the original Italian rhyme scheme. The Americans, Edwin Arlington Robinson and Edna St. Vincent Millay, also used the sonnet form successfully in their poetry. G.F.W.

**SONS OF CONFEDERATE VETERANS** was organized in Richmond, Va., on July 1, 1896. The organization was formed by the sons of men who fought in the Confederate Army during the War between the States. It is a strictly historical and benevolent society. Only male descendants of Confederate veterans are eligible for membership. There are about 50,000 members and former members. The society has general headquarters in Richmond, Va. W.L.H.

**SONS OF LIBERTY** was a group of patriotic societies which sprang up in the American colonies before the Revolutionary War. The Sons of Liberty groups began as secret societies, but later came into the open. They fought against the Stamp Tax of 1765. They opposed the importation of British goods after the passage of the Townshend Acts, and then began to demand national independence. They helped other early moves toward American independence, including the calling of the Continental Congress.

During the War between the States a group of men known as *Copperheads* began to call themselves the *Sons of Liberty*. They were Northern sympathizers with the South, and planned to overthrow the Lincoln government. The plot was discovered and suppressed. J.R.A.

**SONS OF SAINT GEORGE.** See GEORGE, SAINT.

**SONS OF THE AMERICAN LEGION.** See AMERICAN LEGION.

**SONS OF THE AMERICAN REVOLUTION, NATIONAL SOCIETY OF.** This patriotic organization was founded on April 30, 1889. Its purpose was to protect the institutions of government established by the founding fathers. Members are male descendants of an ancestor who either fought or aided in the Revolutionary War, or who contributed toward establishing our Constitution or government. The Society works for a wider understanding of the rights and duties of citizenship. Constitution Day, Flag Day, I Am An American Day, and Bill of Rights Day were established through the efforts of the Society.

The Society has about 18,000 members, and has branches in forty-seven states. It has national headquarters in Washington, D.C. F.B.S.T.

**SONS OF UNION VETERANS OF THE CIVIL WAR** is an American patriotic society. It was organized on September 29, 1879, in Philadelphia. Members are men over sixteen years old who are descendants of Union veterans of the War between the States.

The Daughters of Union Veterans of the Civil War is a similar organization for women. H.H.H.

**Soo CANALS.** See SAULT SAINTE MARIE CANALS; UNITED STATES OF AMERICA (color plate, Picturesque Coastal States).

**SOOCHOW.** See CHINA (Cities).

**SOONER STATE.** See OKLAHOMA.

**SOONG, soong, CHARLES JONES, and "T.V.," TSE-VEN,** father and son, became political leaders in China.

**Charles Jones Soong** (?-1927) was born on Hainan Island, China. He came to the United States in about 1880, and became a peddler. He was converted to Christianity and took the name of a friendly sea captain. Later he was graduated from Vanderbilt University. He then returned to China as a missionary. In Shanghai, he built up a prosperous business as a printer of religious publications. After the 1912 revolution, Soong also printed revolutionary political papers, and his home became a center for the revolution's leaders. He finally became secretary and treasurer to Sun Yat-sen, the leader of the revolution. Each of his three daughters married revolutionary figures. See also CHIANG MEILING; KUNG, "H.H.," HSI-HSIANG; SUN YAT-SEN.

**"T. V.," Tse-ven Soong** (1891- ), son of Charles Jones Soong, was born in Shanghai and was educated at Harvard University. After experience in foreign trade and banking in New York City and Hankow, he joined the revolutionary government of Chiang Kai-shek in Canton in 1924. There he straightened out Chiang's tangled finances.



**"T.V." Soong,** Chinese political leader of the 1940's

Later he helped Chiang win the support of the foreign commercial leaders in Shanghai when Chiang marched on Shanghai in 1927.

As Minister of Finance and as president of the Bank of China Soong then began to reorganize the finances of all China. He helped greatly to stabilize China's currencies and to increase China's foreign trade. Soong lost his position as finance minister in 1933, but later held a variety of official positions. In 1941 he came to the United States where he secured a \$100,000,000 loan for China. Later in the year, he was named Foreign Minister, but spent much of his time in the United States. He was named Acting Premier in 1944 and Premier in 1945. He resigned in 1947.

R.W.Mu.

See also CHIANG KAI-SHEK.

**SOOT** is a black substance which is found in smoke. Soot is made up of tiny particles of fuel, such as coal, wood, or oil, that have not been burned. These particles are usually considered harmful to man and plant life, but they also have a certain value. Soot contains a great deal of carbon and ammonium salts. The ammonium salts contain a large amount of nitrogen, which is an excellent fertilizer. Soot is therefore very useful as a fertilizer.

Soot is used as a pigment, or coloring matter. The soot that is found nearest the fire is usually a shining brown powder containing dried tar. This soot is used as a pigment which is called *bister*. The soot that is found farther up in the chimney is usually black in color. This soot is used as a pigment which is known as *lampblack*.

Soot sticks to anything it touches. For this reason, smoke which blows through a city leaves its soot upon buildings and makes them look dingy. In London, it is said that the damage from soot is several million dollars each year. In some cities, about 3 per cent of the coal that is burned is converted into soot. This is a serious waste and has added to the problem of smoke prevention.

R.G.O.

See also LAMPBLACK; SMOKE PREVENTION.

**SOPHIST**, *SAHF ist*. The Sophists were teachers who came to ancient Athens to give instruction in language, reasoning, and oratory. They were the first Greeks to be paid for teaching. The most famous Sophists were Protagoras, Gorgias, Prodicus, and Hippias. The name *sophist* means *man of wisdom*.

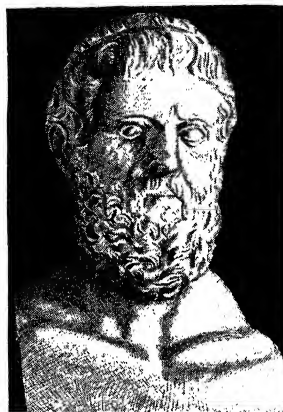
The writings of Plato gave the Sophists a bad name, and the word *sophist* is still used to describe a person who tries to "make the worse appear the better reason." Dishonest arguments are called *sophisms* or *sophistries*. This is unfair to the Sophists, who made important beginnings in grammar, dialectic, rhetoric, psychology, and political theory.

H.M.K.A.

**SOPHOCLES**, *SAHF oh kleez* (about 496-406 B.C.), was one of the three greatest Greek writers of tragedies. During his life he was more popular than either Aeschylus or Euripides, the other two great writers of tragic plays at that time. He was the first writer of dramas to show how a person's own actions can bring about certain results. Always before in Greek drama, characters in plays had been at the mercy of a blind fate. Sophocles' dramas were written in beautiful verse, and showed a deep understanding of human nature, which makes his plays seem natural and real today.

Sophocles wrote almost one hundred plays. Only seven of these plays, plus parts of others, have been pre-

served. He made each play complete in itself, instead of writing three about one subject, as other writers of dramas had done. He used three actors instead of two,



**Sophocles**, ancient Greek writer of tragedies

and thus made it possible to have more action in plays. He enlarged the chorus from twelve to fifteen members, and used it to help explain his plots. His plays were popular with the Greek audiences of his time. Sophocles won first prize for Greek tragedies about twenty times. His first play, *Triptolemus*, was awarded the prize when he was twenty-eight years old.

Sophocles was born in a suburb of Athens. He was educated as an Athenian gentleman and served in political offices as a patriotic duty. Later he was a general in the Samian War. Sophocles became a priest in his old age and was honored as a hero when he died. His son Iophon also wrote tragedies.

S.C.

See also GREEK LITERATURE (The Attic Period).

His Works include *Antigone*; *Oedipus Tyrannus* (see OEDIPUS); *Ajax*; *Electra*; *Trachiniae*; *Philoctetes*; and *Oedipus at Colonus*.

**SOPRANO**, *soh PRAH nah*, is a term describing a type of voice. It may also mean a voice part in compositions for mixed voices. The soprano voice is the highest of four voices. It usually covers more than two octaves above middle C. It may be sung either by a woman's or by a young boy's voice. A soprano part is the upper voice part in a harmonic arrangement to be sung by mixed voices.

R.KEN.

**SORATA**, *soh RAH tah*, is another name for Illampu, a peak of the Andes Mountains in Bolivia. See ILLAMPU.

**SORBONNE**, *sawr BON*, is the name of a famous institution of learning in Paris, the outgrowth of a medieval college of theology. It has belonged to the city of Paris since the middle of the 1800's. The modern Sorbonne is housed in one of the finest university buildings in the world. It dates from 1889 and is known as *La Nouvelle Sorbonne* (the New Sorbonne). The institution maintains faculties of science and literature and has splendidly equipped laboratories, lecture rooms, and libraries.

The old Sorbonne was founded in the 1200's by Robert of Sorbon. It was originally a hall of residence for poor theological students. Gradually it became one of the strongest theological schools in Europe. Cardinal Richelieu rebuilt it in the 1600's, and provided a magnificent chapel for the students. In 1808 Napoleon reorganized the institution. The faculty of theology was abolished in 1885.

Before World War II, the Sorbonne was attended each year by nearly 13,000 students from many parts of the world, including the United States.

L.L.K.

**SORDELLO**, *sohr DEL loh*, was a famous Italian troubadour, or minstrel, of the 1200's. Robert Browning wrote about him in his poem, *Sordello*, and he is also mentioned in Dante's *Purgatory*. Sordello is believed to have been born in Goito, near Mantua, growing up to a wild and adventurous life. Sordello spent most of his life in France, and died in Provence. See also **MIX-STREL**. C.M.E.

**SOREL**, Quebec (population 12,251), is an industrial and shipping center at the meeting point of the Richelieu and Saint Lawrence rivers. It has a good port with a deep-water front, and is on the Canadian National Railway. The chief industries of Sorel are shipbuilding and ship-repair plants, steel foundries, lumber mills, clothing and shirt factories, liquid-air compressor plants, and cooking-utensil factories. J.A.D.

**SORGHUM**, *SAWR gum*, is the name of a group of plants in the grass family. It is native to the warmer parts of the Old World, and is raised in the southern states of the United States. One class of sorghums contains a sweet sap from which sorghum sirup is made. The sorghums are tall plants with many small seeds growing in "heads," or clusters, on the ends of the stems and twigs. The stalks are tall, ranging from six to fourteen feet in the different varieties.

The plants which yield sirup are known as *saccharine*, or *sweet*, sorghums. The others are classed as *nonsaccharine*, *grain*, or *seed*, sorghums. *Broomcorn* is one of the best-known varieties of the seed sorghums. Sweet sorghums are grown for their sap, for forage, and for packing in silos.

When sirup is made from sorghum, the stems are passed between rollers to squeeze out the juice. The juice is then put through several processes of boiling, skimming, evaporation, filtration, and purification.

Sweet sorghums resist drought. They are grown chiefly in South Dakota, Kansas, Nebraska, Texas, and Oklahoma. About 31,800,000 gallons of sorghum sirup are produced each year in the United States.

**White Milo**. This plant has slender stalks seven to ten feet high or more. The stalks have many leaves, and

contain a large amount of juice. The seed heads are rather short, compact, and thick, and are borne on erect stems. The plant also produces wide branches. Its seeds are large, white, and flattened on two sides. White milo matures fairly early. The first crops are ready two and one half to three and a half months.

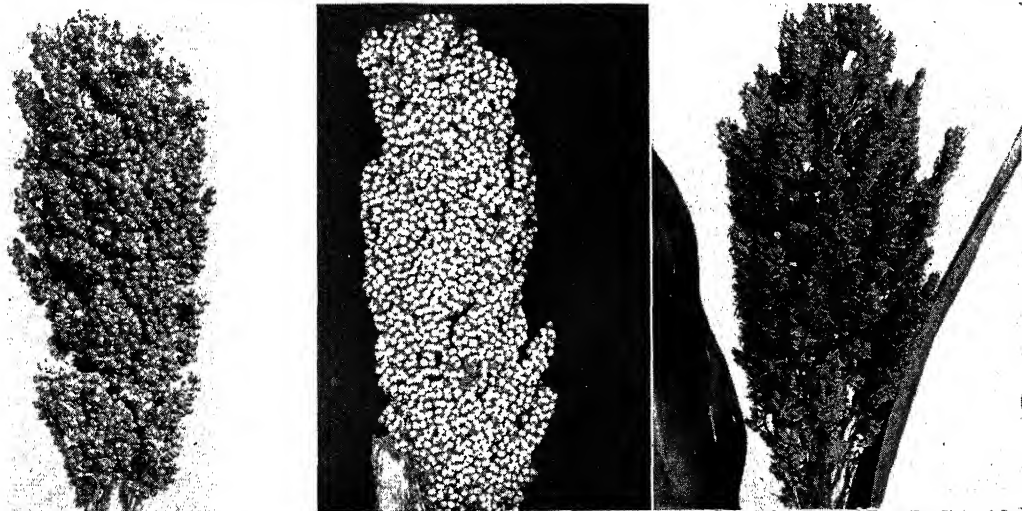
**White Durra**, or **Jerusalem Corn**. The stalks of this sorghum are rather slender, and grow four to eight feet high. Like most of the durras, this plant contains little juice, and produces so few leaves that it has little value as forage. Many of the heads curve or turn down on the stems. The heads are six to ten inches in length. They are broad, thick, egg-shaped, and fairly compact. The kernels are almost white. The grain has been used for chicken feed. Crops usually mature in two and one half to a little more than three months after planting. Better varieties have gradually been replacing white durra. See also **BROOMCORN**; **KAFFIR**; **SACCHARIN**. F.T.H.

**Classification**. *Sorghum* is a genus in the *Gramineae* family. *Durra* is *S. vulgare*, var. *Durra*. *Milo* is *S. vulgare*, var. *Milo*.

**SOROLLA Y BASTIDA**, *soh ROHL yah ee bahs TEE-thah*, **JOAQUÍN** (1863-1923), was a Spanish painter of the Impressionist school.

**SOROPTIMIST INTERNATIONAL ASSOCIATION** is an organization of service clubs for professional and executive businesswomen. Each member of a Soroptimist Club must represent a different business or profession. Soroptimist Clubs have been organized in more than twenty countries. Soroptimists in the United States have as their objectives the economic advancement of women and world peace. The first Soroptimist Club was founded in Oakland, Calif., in 1921. The American Federation of Soroptimist Clubs and the International Association were both founded in 1928.

**SORORITY**. The sorority is a Greek-letter society for college women which corresponds to the *fraternity* for men. The term *sorority* comes from the Latin word *soror*, meaning *sister*. Sororities and fraternities have similar aims and organization. Both have been praised as a force which leads to friendship and social bonds



Photos: J. Horace McFarland; Coop. Ext. Work in Agr. and Home Ec., State of Ga.

Three Types of Sorghum. Left to Right Are Red Top African, Hegari Grain Sorghum, and Milo Maize

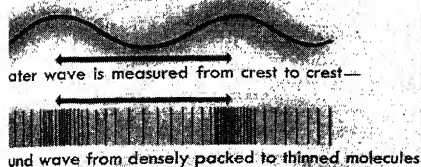


# SOUND



Sound is produced by vibrations of air. A vibrating prong compresses the air in one direction and thins it in the opposite one, as it moves rapidly back and forth. The compressed air moves in a series of waves which beat against the ear drum, causing it to vibrate.

## WAVES OF SOUND



A vibrating tuning fork held against smoked glass leaves a wavy pattern.



1 Second  
Greater wave amplitudes face louder sounds  
1 Second  
Greater number of vibrations cause higher pitch

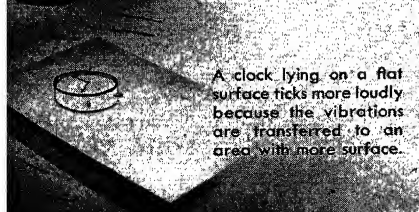


Diagram of sound waves with overtones. The overtones produce tone quality.

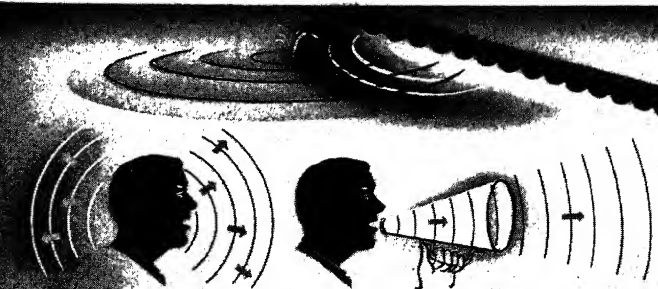
## HOW SOUND TRAVELS



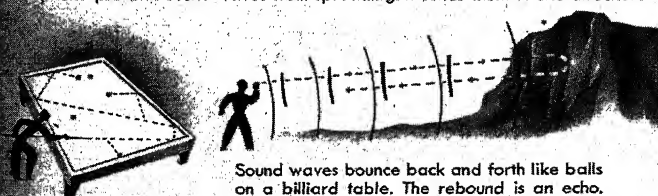
Sound must have a medium in which to travel. In a vacuum jar the ticking of a clock is inaudible.



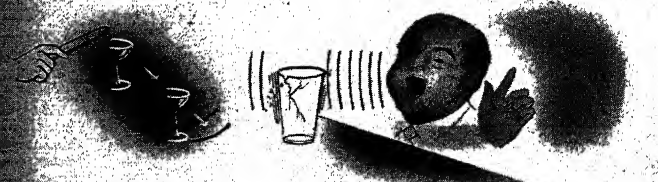
A clock lying on a flat surface ticks more loudly because the vibrations are transferred to an area with more surface.



Sound waves spread like ripples on water, but in all directions. A megaphone prevents sound waves from spreading. It sends them in one direction.



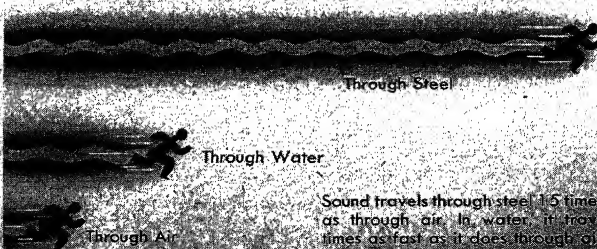
Sound waves bounce back and forth like balls on a billiard table. The rebound is an echo.



Sound waves set up vibrations in other objects. By singing the correct pitch, Caruso could vibrate a water glass until it shattered.



Some sounds cannot be detected by the human ear. Electronic tubes are used to record them.

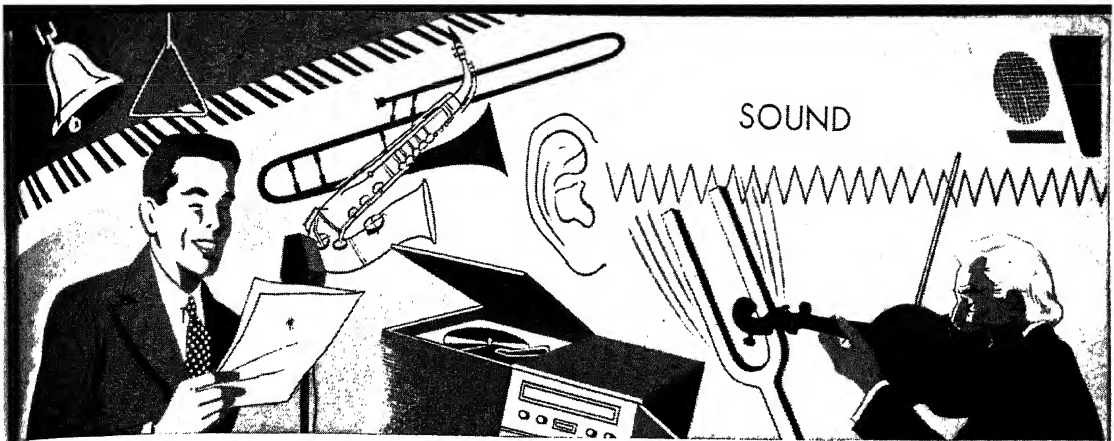


Through Steel

Through Water

Through Air

Sound travels through steel 15 times as fast as through air. In water, it moves four times as fast as it does through air.



**SOUND.** You have heard the sound of airplanes overhead, the tramp of the feet of marching soldiers, the tick of a clock, the music of an orchestra, or the voice of a friend. All these and other sounds with which you are familiar have one thing in common. To form any sound, something is moving back and forth in quivering movements, which are called *vibrations*.

If you place your finger upon a sounding bell or a playing stringed instrument, you will feel the quivering or vibrating movement of the bell or string. If you stop this movement, the sound ceases.

Not only do the particles of the sounding bell or playing string vibrate. They also cause the particles of the surrounding air to quiver or vibrate. The vibration of the surrounding air is due to two things. First, the particles of air near the vibrating object are pushed closer together or compressed as the particles of the object move outward. Second, the air rushes or expands into the space occupied by the vibrating particles of the object when these particles move backward.

Thus, for every vibration of the particles of the sounding object, there is a corresponding compression and expansion of the surrounding air. These compressions and expansions of the air near the source of the sound cause the air particles beyond to be compressed and expanded. A quivering or vibrating motion goes through the air in all directions until it spreads so much that it is weakened and finally dies away.

The air can carry many vibrations at the same time, and they travel in many different directions. But each vibration travels as if it were the only one present.

It is impossible to do anything without setting up these quivers or vibrations in solids, liquids, or gases (usually air). Man and most other animals have hearing devices, or ears, which can detect these sound vibrations.

The ear is so constructed that it can catch sound vibrations that come to it through the air. These vibrations pass down the tube of the ear until they finally reach delicate organs within. Here, the vibrations are sent to the brain over sensitive nerves, and are understood as sounds. The brain interprets what we hear. For example, we can distinguish the voices of our friends by the differences in the sound waves which they produce.

Some sounds are caused by vibrating particles which do not have enough energy to cause the eardrum to vibrate. Consequently they are not loud enough to be heard. Sounds that approach the limit of hearing are said to approach the *threshold of audibility*. On the other hand, some sounds are caused by vibrating particles which have so much energy that the sound is painful to

the ear. This condition is known as the *threshold of feeling*. The threshold of feeling is often reached when violent explosions occur, when large cannons are fired, or even when a loud clap of thunder takes place. The energy of a sound that has reached the threshold of feeling is about five billion times as great as the energy of the sound that comes from an ordinary whisper.

**Nature of Sound Waves.** When a series of vibrations is set up in matter, waves are produced. There are two general types of waves, transverse and longitudinal waves. When a stone is thrown into a pool of water, the waves which are produced travel in circles outward from the point at which the stone struck the water. But while the waves travel along the surface of the water, the water particles which form the waves move up and down or at right angles to the direction of the waves. Evidence of these relative motions can be seen by watching the motion of a floating object in a body of water through which waves are moving. The floating object goes up and down while the waves move parallel to the surface of the water.

When vibrating particles move at right angles to the direction of the motion of the wave, as they do in water waves, the waves are known as *transverse waves*. Such waves as light waves, electrical waves, radio waves, and all electromagnetic waves are transverse waves.

Sound waves, on the other hand, travel along the line of the back-and-forth movement of the particles which produce them. These waves are known as *longitudinal waves*. Longitudinal waves can be seen by attaching one end of a long spiral spring to a support, allowing the other end to hang freely, and pulling apart and then releasing several turns near the free end. The stretch is seen to travel up to the attached end of the spring and return again to the free end. Likewise, if several of the turns of the spring at the free end are pinched together and released, a wave of compression can be seen to travel up to the attached end and return.

Sound waves travel like the waves of the coiled spring. For example, sound waves which travel in air consist of the compressed air particles as well as the "stretched" or rarefied air particles moving back and forth along the direction of the wave.

**What Makes Sound.** If a tuning fork is struck, a sound will be produced. If the prongs of the sounding tuning fork are thrust into a glass of water, the vibration of the fork will make the water splatter.

If a brass rod about 100 centimeters long is clamped securely at the middle so that one end of the rod touches a suspended ball, the rod will produce a shrill sound

when it is stroked with a resined cloth. The suspended ball will rebound from the end of the rod. This shows that the rod is vibrating in the direction of its length. When a bell is struck or a violin string is plucked or bowed, sounds will be produced. If the sounding bell or string is touched gently with the finger, vibrations can be felt. These and similar examples show that sounds arise when a body vibrates.

**Qualities of Sound Waves.** Since we are able to distinguish one kind of a sound wave from another, they must have different characteristics. If the sounds are musical, the three distinguishing characteristics are *pitch*, *loudness*, and *quality*.

Pitch is determined by the rapidity with which an object vibrates. If the vibrations are rapid, we say it has a higher pitch than when the vibrations are slow. This can be illustrated by mounting a toothed wheel so that it can be rotated at different speeds and a card held so that each rotating tooth strikes the card. The card is set into vibration by the rotating teeth. When the rotating wheel is speeded up, the card vibrates more rapidly. The ear recognizes a higher pitch than when the wheel rotates more slowly.

Other common experiences which illustrate the relation of pitch to the rate of vibration are an electric motor, an electric fan, and a circular saw. The pitch of the notes given off by any of these appliances rises as the speed of the appliance increases, and falls as the speed decreases.

The pitch of the sound given off by a phonograph rises as the speed of the machine increases and falls as the speed decreases. Sound pictures must be projected at the same speed at which they were made if the pitch of the sound is not to be changed.

You have, no doubt, noticed the difference in pitch of the whistle of a locomotive or that of a sounding automobile horn as they approach and pass you. When they approach, the pitch is higher than when they recede. Since pitch is due to the number of vibrations that reach the ear per second, there must be more vibrations per second that reach the ear when the locomotive or automobile is approaching than when it is receding. This happens because the waves are crowded closer together upon the approach and pulled out longer after the sounding whistle or horn pass. This causes more vibrations per second to reach the ear when the sounds approach than when they recede. This apparent change in pitch of the sounds is known as the Doppler effect, after Christian Doppler, who was the first to discover and explain it.

**Loudness and Intensity of Sound.** These two words are often used as if they meant the same thing. But they have different meanings and should not be confused in use.

Intensity of sound refers to the amount of energy flowing in the sound waves, while loudness of sound refers to the apparent strength of the sensation received by the eardrum and sent to the brain. For different individuals the same intensity of sound may produce different loudness of sound. However, for the same person the intensity and loudness of sound have several common factors. They both depend upon four things: the distance from the origin of the sound, the amplitude of vibration, the

density of the medium through which the sound travels, and the area of the vibrating body.

The loudness of a sound grows less as the distance between a person and the sounding body increases. This is due to the fact that sound waves move out from their source in all directions and form concentric spheres about the place where the sound comes from. Since the radii of the spheres increase as their distances from the origin of the sound increase, the energy which is flowing in the sound waves is spread over a greater area. Therefore it becomes less for each unit of area. Since the area of spheres increases as the square of their radii, the loudness of a sound decreases inversely proportional to the square of the distance a person is from the origin of the sound. This means that a sound will be four times as loud to a person one foot from the origin than when the same person is two feet from the origin, or it will be nine times as loud to a person one foot from the origin than when he is three feet from the origin.

Amplitude of vibrations means how far the particles that are vibrating swing from their position before vibrations begin. For example, the amplitude of vibration of a boy swinging in a park swing is the distance he moves to either side of the position of swing before it begins to move.

It takes more energy to cause a swing to have a large amplitude than to have a small amplitude. Just so it requires more energy for an object such as a tuning fork or a string of a violin to have a large amplitude than a small amplitude. Therefore, the larger the amplitude of a sounding body, the louder the sound will be. It can be shown that the loudness of a sound varies as the square of the amplitude of the vibrations.

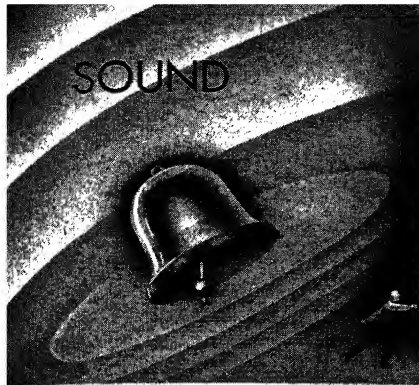
The loudness of a sound transmitted by a medium becomes less as the density of the medium becomes less. Perhaps you have compared the loudness of a sound when two stones are struck together under water with the loudness of the sound produced when the stones are struck together in air. If so, you have noticed that sound is much louder under water. This is because the water is more dense than the air.

Proof that the area of the vibrating body affects the loudness of a sound may be shown by causing a tuning fork or even a table fork to vibrate and then placing the handle against the top of a table. The loudness will be much greater when the fork is placed upon the table top because the particles of the table top are forced to vibrate. This increases the area of vibration. The purpose of the sounding board of a piano is to increase the area of vibration so the sound will be louder.

A factor that does not affect intensity but does affect loudness is the pitch of a sound. The sensitivity of the ear varies with the pitch. The sensitivity is low at low pitches, but increases as the pitch increases, until it reaches a pitch caused by about 1,000 vibrations per second. After this point the sensitivity to sound falls off again.

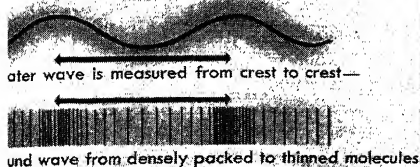
**Measuring Sound.** Different units for measuring intensity and loudness must be used because of this sensitivity of the ear in this relation to pitch. The unit for measuring intensity of sound that is commonly used is called the *decibel*. The unit for measuring loudness of sound is called a *phon*. Both units involve many factors

# SOUND



Sound is produced by vibrations of air. A vibrating prong compresses the air in one direction and thins it in the opposite one, as it moves rapidly back and forth. The compressed air moves in a series of waves which beat against the ear drum, causing it to vibrate.

## WAVES OF SOUND



A vibrating tuning fork held against smoked glass leaves a wavy pattern.



1 Second  
Greater wave amplitudes face louder sounds  
1 Second  
Greater number of vibrations cause higher pitch

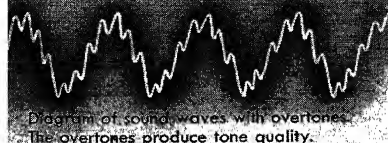
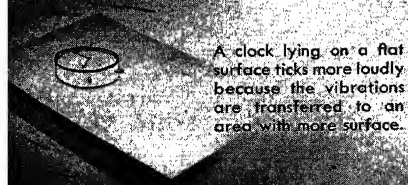


Diagram of sound waves with overtones. The overtones produce tone quality.

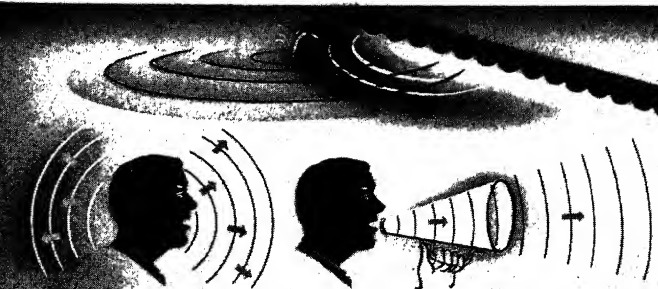
## HOW SOUND TRAVELS



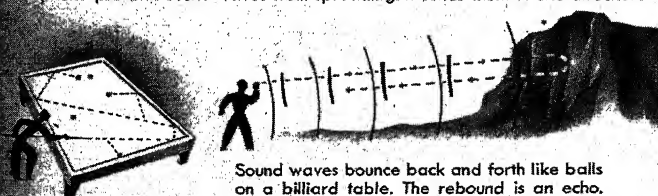
Sound must have a medium in which to travel. In a vacuum jar the ticking of a clock is inaudible.



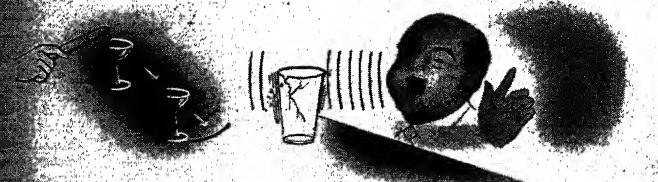
A clock lying on a flat surface ticks more loudly because the vibrations are transferred to an area with more surface.



Sound waves spread like ripples on water, but in all directions. A megaphone prevents sound waves from spreading. It sends them in one direction.



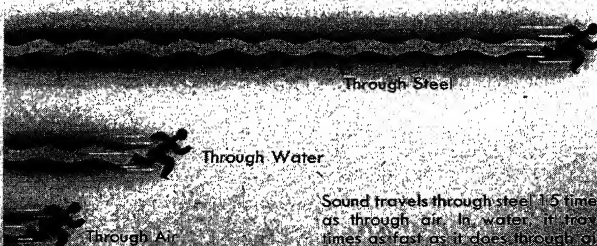
Sound waves bounce back and forth like balls on a billiard table. The rebound is an echo.



Sound waves set up vibrations in other objects. By singing the correct pitch, Caruso could vibrate a water glass until it shattered.



Some sounds cannot be detected by the human ear. Electronic tubes are used to record them.



Through Steel

Through Water

Through Air

Sound travels through steel 15 times as fast as through air. In water, it moves four times as fast as it does through air.





General Electric

**The Sound Meter Finds Out** how loud an elephant can trumpet. Because the meter measures only the volume of the

sound, and not the pitch, or note, a canary's song may register as many sound units as the grunt of the elephant.

which make them rather complex. However, generally speaking, a phon represents the minimum increase of the loudness of sound which the normal ear is capable of detecting. The loudness of an ordinary speaking voice is about 60 phons. Other common sounds have the following loudness: whispering, 20 phons; motor horns, 90 phons; airplane cabin, 100 phons; noisy airplane engine 10 feet away, 120 phons; and the threshold of pain, 130 phons.

The intensity of sound waves may be measured by units called *bel* and *decibel*. The measure of intensity of sound is a measure of the energy which produced the sound. The bel, named after Alexander Graham Bell, is a unit of intensity of sound. The decibel is one tenth of a bel.

These units are rather complicated because they contain so many factors. However, a decibel is approximately the smallest change in intensity that the human ear can detect. A few relative measurements will enable one to get some idea of the value of a decibel. The smallest sound one can hear has an intensity of one decibel. The rustle of leaves in a slight breeze has an intensity of 10 decibels. The normal speaking voice has an intensity of 60 decibels. Loud music has about 90 decibels. A noisy airplane 10 feet away has about 120 decibels; 130 decibels approaches the threshold of pain.

**Noise and Music.** Sounds are either noisy or musical. A noise is produced by the vibrating body which sends out irregular vibrations at irregular intervals, such as occur when a book falls to the floor. Music is made by the vibrating body sending out regular vibrations at regular intervals, such as the note from a violin string. Noises may also be produced by a combination of musical sounds such as is heard when an orchestra is "warming up." These several musical sounds become noise because we are unable to analyze such sounds and determine

their regularity. However, when properly directed, the sounds from the orchestra are blended and music results.

The average human ear can hear sounds caused by vibrations which occur anywhere from 16 to 20,000 times per second. The lowest tone on the piano has 27 vibrations per second while the highest tone used in music has about 4,000 vibrations per second. If the frequency is either less or more than the ear can receive, there is still a sound produced, but it will not produce the sensation that is usually produced by sound waves. Individuals differ in the number of sound waves per second they are capable of hearing. Therefore one person may hear a certain sound and another person may not. Some animals have ears that are capable of hearing frequencies either above or below the frequencies that the human ear can receive. For this reason they can better protect themselves from dangers that may be indicated by sounds.

One of the characteristics of a musical tone is quality, which distinguishes a particular pitch of a given intensity produced by one musical instrument from the same pitch and same intensity of another musical instrument.

For example, it is quality that distinguishes between tones that come from a violin or tones that come from a banjo, even though the tones both have the same pitch and intensity.

What determines the quality of a musical tone? Musical tones are generally the result of the blending of many frequencies caused by the sounding body's vibrating as a whole and in parts at the same time. For example, a violin string of a certain length and under a given tension may vibrate as a whole 256 times per second. At the same time it may vibrate in two parts just as it would if it were held at the center and both segments were caused to sound. Since the two parts are only half as long as the whole string, the halves would vibrate twice as fast, or



512 times per second. The 512 vibrations produce a tone one octave higher than the 256 vibrations produce. The number of vibrations that the string makes as a whole produces the fundamental pitch of the string, while the number of vibrations that each half of the string makes, produces the first overtone. The string may vibrate in several parts while it is vibrating as a whole and produce many overtones. The quality of a tone is determined by the character and number of overtones produced. By character we mean the relative strength of the overtones present in the tone.

Different persons' voices produce different overtones. Great singers are able to produce many overtones with their voices and therefore have better tone quality than persons who are not able to produce so many overtones.

**Beats.** When two tuning forks that have exactly the same frequencies, say 256 vibrations per second, are sounded together, their tones will blend, and reinforce each other. However, if one fork vibrates 256 times per second and the other fork vibrates 257 times per second, there will be a swelling and fading of sound at regular intervals. In this particular instance there will be one pulsation of loudness per second. This pulsation of loudness is called a *beat*. It is due to the fact that the forks do not keep in phase or step. They are beating together at the beginning of each second; therefore, they reinforce each other once each second. They also have a maximum reaction toward each other once each second. There will be as many beats per second as their number of vibrations differ per second.

When the number of beats produced by two sounding bodies is not more than five or six per second, most persons pay little attention to it. But if the number of beats increases to thirty per second, the sound is most unpleasant and we recognize a dissonance. As the number of beats increases above 30 per second the sensation of unpleasantness decreases.

Musical instruments may be tuned together by changing the pitch so that beats are eliminated.

### Production of Musical Sound

There are three types of musical instruments: stringed, wind, and percussion instruments. They are so called because the words refer to the kinds of vibrating bodies that produce the tones.

**Stringed Instruments.** Strings are usually stretched over some kind of a resonance box or board such as that of a violin, piano, or guitar.

There are three laws which control the pitch of stringed instruments. The frequency, which controls the pitch, is inversely proportional to the length of the string. The frequency is directly proportional to the square root of the tension of the string. The frequency is inversely proportional to the square root of the mass per unit length of the string. Therefore a tight, heavy string has lower pitch than an equally tight light string.

The length of the vibrating portion of a string on the violin and many similar instruments is controlled by pressing the fingers on the finger board at different locations. The tension is controlled by turning the posts, or pegs, to which one end of the strings are attached. The mass per unit length is controlled by having different kinds of strings for a range of different tones.

The quality of stringed instruments, like all other musical instruments, depends upon the prominence and number of overtones it can produce.

**Wind Instruments.** Perhaps you have blown across an empty cartridge shell or the cap of a fountain pen and produced a musical tone. The stream of air directed across the edge of the opening of the cap or shell, which we may call a pipe, produces a vibrating air jet which has a frequency that depends upon the length of the pipe. If the pipe is closed at the bottom, the note has a wave length four times the length of the pipe. If the pipe is open at both ends the note has a wave length twice the length of the pipe.

All wind instruments work upon the above principle. The pipe organ has pipes of definite lengths. Other wind instruments such as clarinets, flutes, and horns have the length of the column of air which produces sound regulated by pressing upon valves.

The overtones and fundamental tones of wind instruments are partially controlled by the intensity with which the player blows.

Reeds and membranes are used in some wind instruments to cause the air column to vibrate. The saxophone, oboe, and clarinet are reed instruments.

**Vocal Cords.** The human voice is an example of air columns caused to vibrate by membranes. A pair of membranes, called vocal cords, are located on each side of a box, called the larynx. These are caused to vibrate by forcing air past them. A change in muscular tension on the cords produces different pitches, and a change in the shape of the mouth helps to give overtones which determine the quality of the voice.

**Percussion Instruments.** A drum is one example of a percussion instrument. It has a membrane stretched tightly over the ends. The beating of this membrane sets it in vibration and produces a sound.

Vibrating plates such as cymbals, bells, and chimes are set in vibration by striking the plates. They, like the drum, often produce unpleasant sounds when they are used alone but produce musical effects when used with other instruments.

**How Sound Travels.** You have, no doubt, read of how Indians used to put their ears to the ground in order to detect the approach of an enemy. You may have placed your ear to a rail to hear the approach of a train which was still out of sight. The flash of lightning is often seen many seconds before the roar of the accompanying thunder. Steam from a whistle may be seen from a distant railroad engine or ship before the sound of the whistle is heard. All these experiences indicate that sound travels through the medium that exists between the vibrating body and our ear.

That sound requires a medium through which to travel can be shown by placing an electrical bell with proper electrical connections under a bell jar from which the air can be removed by a vacuum pump. When the electric circuit is closed, the sound of the bell can be heard before the air is removed. As the air is removed by the pump, the sound of the bell becomes fainter until enough air is removed that the sound cannot be heard. This experiment proves that sound cannot travel in a vacuum, and that it does require some medium through which to travel. While most sounds reach the ear through

the air, solids and liquids will also transmit sounds. In fact, sound will travel much faster through liquids than it does through air. It will travel much faster through solids than it will through liquids.

The reason why sound travels at different speeds through different mediums is that the speed of sound depends upon two factors, namely, the density and elasticity of the medium through which it travels. The speed of sound varies directly as the square root of the elasticity, and inversely as the square root of the density of the medium through which it travels. Because of these two factors, sound travels approximately 4,714 feet per second in water, 16,410 feet per second in steel, and 1,090 feet per second in air which is 0° on the centigrade scale. From the above figures you can see that sound travels approximately four times as fast in water as it does in air, and fifteen times as fast in steel as it does in air.

Since the density and elasticity of air change as the temperature changes, the speed of sound in air changes as the temperature changes. The higher the temperature, the faster sound travels in air. In fact, the speed of sound increases 2 feet per second as the temperature of air increases 1° C. For example, the speed of sound at living-room temperature (20° C.) is 40 feet per second more than at 0° C. The higher temperature makes it travel at  $1,090 + 40 = 1,130$  feet per second.

By knowing the approximate temperature and the time in seconds that elapses between a flash of lightning and the sound of thunder, you can tell how far the lightning was from you. Roughly, if you multiply the time in seconds by 1,100, the result will be the number of feet the lightning was away. For every five seconds that elapse between the lightning and the sound of thunder, the lightning will be approximately one mile away.

#### How Sound Waves Are Reflected and Absorbed.

Since sound travels in all directions from a vibrating body, the sound energy is distributed over a larger area as the distance from the origin increases. Therefore, its intensity decreases rapidly as the distance from the origin increases. It is for this reason that the cheerleader of a high-school or college group uses a megaphone to direct and concentrate the sound energy in any desired direction. The megaphone prevents the sudden spreading of the sound waves and causes more of the sound energy to go in the desired direction. The same effect can be obtained in a smaller way by using your hands as a small megaphone.

**Insulation against Sounds.** Many people live in apartments where only walls and floors separate one family from another. Therefore it is important that the sounds made by one family do not interfere with the other families. Physicists and engineers have developed materials that will either absorb or reflect sounds and thus eliminate much undesired noise. For example, floors, walls, and ceilings can be covered with materials that absorb sound energy. Double walls, double floors, and suspended ceilings also help to keep sound waves from being transmitted from one room to another.

**Echoes.** Echoes are common experiences. We know that echoes can be produced by shouting while standing some distance from a cliff, woods, or large building. In order to produce an echo, the sound wave we send out

must strike some surface of different density from the surrounding air and be bounced back to us just as a rubber ball bounces back from a concrete wall. However, if we stand too close to the reflecting surface we do not hear an echo. This is due to the fact that a sound sensation lasts approximately one tenth of a second. If a second sound is made within one tenth of a second we are unable to separate the two successive sounds. If a reflected sound wave (echo) is to be heard, one tenth of a second must elapse between the original sound and the reflected sound. Since sound travels in air 1,130 feet per second at ordinary temperature (20° C.) it will travel 113 feet in one tenth of a second. Therefore the reflecting surface must be at least one half of 113 feet, or 57 feet, away if we are to recognize an echo. If the reflecting surface is less than 57 feet away, the reflected sound waves come back and strengthen the original sound waves.

**Sympathetic Vibrations.** If two rope swings of equal lengths are suspended from the same horizontal limb of a tree and if one of the swings is set into motion, the other swing will be set into motion caused by small impulses which are carried through the limb to the second swing from the first swing. The vibrations of the second swing are called sympathetic vibrations, since the second swing vibrates because the first swing vibrates. This would not occur if one swing were a little longer than the other.

A bridge can be set in motion by sympathetic vibrations if soldiers marching across it do not break step. Often, dishes in the cupboard or picture frame wires will sound when a certain note is sounded upon the piano. This is caused by sympathetic vibrations. It is said that Caruso, the great singer, could shatter a glass tumbler by singing a certain note into it. This was due to sympathetic vibrations.

**Resonance.** Resonance takes place when small impulses produce large vibrations by having the same frequency as the natural period of a vibrating body.

Resonance plays an important part in all kinds of musical instruments. This can be shown by holding a sounding tuning fork over a tube that is open at one end and closed at the other. If the tube is approximately one fourth as long as the wave that comes from the fork, the tuning fork will sound much louder than when it is not held over the tube. This is due to resonance. The wave from the fork goes down the tube, strikes the bottom, and is reflected back to the fork just in time to hit the fork at the proper time to cause it to have a longer amplitude and thus increase its loudness.

Of course, if the tube is not the proper length the wave will get back to the fork at an instant when it will act against the vibrating fork and tend to cause it to stop. This is called interference of sound waves.

#### Ultrahigh Sound Waves or Supersonic Waves

By the use of electrical circuits in which the vibration of electrical charges takes place, scientists are able to cause diaphragms, plates, and other materials to vibrate up to 200,000 vibrations per second. This is, of course, far beyond the range that the human ear can receive. Supersonic waves are not electrical but are waves in matter such as air and water. They are often used to

find the depth of the ocean, to locate sunken ships, and in biological research.

### How Sound Waves Are Studied

The frequency and amplitude of a tuning fork may be studied by attaching a metal pointer to a heavy tuning fork and moving a smoked glass at a definite speed along the vibrating fork so that the pointer just touches the glass. A curve will be made upon the smoked glass from which the frequency and amplitude can be studied.

But this method of study does not aid in analyzing the quality of sound. Herman von Helmholtz, a German scientist, made a set of spherical resonators, each of which responded to definite wave lengths or pitches. By placing these resonators to his ear, one after another, while a musical note was playing, he was able to select the fundamentals and overtones that made up the note. He thus proved that quality is dependent upon the overtones in a note.

Later a gas flame was used to observe the characteristics of a tone. The apparatus used for this experiment consisted of a membrane which divided a sealed box into two parts. One part of the box had attached to it a tube with a mouthpiece. The other side of the box was attached to a tube that led to a gas burner and also to another tube that led to a gas outlet. The gas that fed the burner had first to go through the box. The gas jet was lit and the flame was reflected from a square mirror which revolved at a constant speed by the use of an electric motor. When the flame burned naturally the revolving mirror reflected a straight band of light. But when a sound entered the mouthpiece and the wave traveled down the tube into the box, the wave caused the membrane to vibrate and change the pressure of the gas on the other side of the box. These changes of pressure caused the flame to go up and down and make a zigzag band of reflected light from the revolving mirror.

Dayton C. Miller of Cleveland, Ohio, invented an instrument called the *phonodisk* with which he could take pictures of sound waves. This instrument consists of a horn with a diaphragm over the small end. Attached to the diaphragm is a very fine wire which passes once around a vertical shaft which is free to rotate. A small mirror is attached to the shaft. A beam of light from a fixed point is caused to shine upon the mirror. When a sound wave enters the horn it causes the diaphragm to vibrate. The vibration of the diaphragm causes the fine wire either to be pulled or the tension released and thus cause the shaft to turn. The mirror on the shaft reflects the beam of light on a vertical strip of film which is made to move vertically at a uniform speed. The rotation of the shaft causes the mirror to reflect a horizontal back-and-forth movement of the light upon the vertical moving film. This motion of the light upon the film records the relative motion of the diaphragm, which is caused by the sound wave which entered the horn. Thus, a picture of the sound wave is recorded upon the film. With this instrument Miller obtained pictures of the human voice and various musical instruments, which he analyzed with respect to pitch, amplitude, and quality.

### The Importance of Sound

Try to imagine what this world would be like without sound. For our protection we hear danger signals. We use our voices either in direct speech or in communication by telephone or radio. For our pleasure we hear music, broadcasts of sports events, plays, and sound motion pictures.

Sound waves help aviators to find their altitude, help sailors to locate icebergs and submarines, and aid soldiers in locating enemy artillery. Either in peace or war, sound waves are important factors in our lives. And sound was just as important in the life of primitive man.

**Dangers of Sound.** When we close our eyes we shut out the light and rest our visual sense. On the other hand, we have no way of shutting out noises. Even though we may be asleep and unconscious of them, noises affect us continually.

Sounds that are harmful may affect us in two ways. Noises that are intense may produce actual deafness, as has sometimes occurred with boilermakers and artillerymen. Noises that are either continuous or intermittent may cause persons to be tired or irritable.

Recent studies of noises in offices and shops have shown that intense, continuous, or intermittent noises reduce the production of the office or shop as much as 50 per cent of the normal output. Studies have also been made of the sleeping quarters of workers in regard to noise. These studies show that persons who sleep where there is little noise are much better rested when they arise than those who sleep where there is much noise, such as that from near-by streets, railroads, and other noisy places.

E.O.B.

**Related Subjects.** The reader is also referred to:

Acoustics	Motion Picture (How Pictures and Sound Are Recorded)
Decibel	
Detector, Supersonic	Music (The Elements of Music)
Ear (How Man Hears)	
Echo	Noise
Harmonics	Pitch
Interference	
Megaphone	

### Questions

What is the actual cause of any sound?

What are the three distinguishing characteristics of sound?

What determines pitch? What happens to the pitch of a phonograph record if the speed of the machine is increased? Why?

Why does an automobile horn sound louder when the car is coming toward a person than when it is moving away from him?

How is loudness of sound measured? About how many phons is the loudness of the ordinary speaking voice? A motor horn?

How is intensity of sound measured?

What is the difference between noise and music?

What is the range of sound-producing vibrations that the human ear can hear? Why can some persons hear sounds that others cannot hear?

How can you tell how far away lightning is from you?

**SOUNDING** is the way of finding the depth of water. It is important for every navigator or pilot to know how much water there is between the bottom, or keel, of his vessel and the bed of the ocean, river, or lake. Otherwise the ship may go aground.

The simplest type of sounding machine consists of a lead weight which is attached to a line of heavy rope. This device is called a *plummet*. The line is marked off in fathoms. Each fathom is equal to six feet. The lead is dropped into the water, and as it sinks it carries the line with it until it reaches the bottom. Most sounding machines have the lead weight hollowed out so that a sample of the material making up the ocean bed can be brought up.

One of the latest types of sounding machines that have been developed has used waves which cannot be heard by the human ear. This machine works on the principle that sound travels through water until it strikes a solid object and then it is reflected, or echoed back again. It takes a certain length of time for a sound, or signal, to travel to the bottom and return. The deeper the water, the longer it takes. This type of sounding machine figures automatically the depth of the water on the basis of the time taken for a signal to travel to the bottom and come back again. Radio waves are used in other sounding equipment. E.G.St.

See also FATHOM; FATHOMETER; LEAD, SOUNDING; PLUMMET.

**SOUNDING BALLOON.** See AERONAUTICAL METEOROLOGY.

**SOUNDPROOFING.** See ACOUSTICS; INSULATION.

**SOUR CHERRY.** See CHERRY.

**SOUR CLOVER.** See CLOVER (Sweet Clover).

**SOUR GUM.** See BLACK TUPELO.

**SOURIS, SOO ris, RIVER.** See ASSINIBOINE RIVER.

**SOURWOOD.** See SORREL TREE.

**SOUSA, SOO sah, JOHN PHILIP** (1854-1932), was America's most famous composer of band music. He was also a noted bandmaster. His lively and tuneful marches won him the title "The March King."

Sousa was born in Washington, D.C., where he studied music. At the age of seventeen he became con-

ductor of an orchestra. From 1880 to 1892, he led the United States Marine Corps Band, but founded his own band in 1892. Between 1900 and 1905, Sousa and his band made four tours of Europe, and in 1910 and 1911 toured the world.

During the Spanish-American War Sousa was a musical director for the United States Army. In World War I, he organized bands at the Great Lakes (Ill.) Naval Training Station. The navy officially adopted his collection entitled *National Patriotic and Typical Airs of All Countries*. Sousa left his huge collection of band music to the concert band of the University of Illinois. G.B.

See also BAND.

**His Works** include the marches "Semper Fidelis"; "Stars and Stripes Forever"; "El Capitan"; "Washington Post"; and "High School Cadets." He also wrote several comic operas.

**John Philip Sousa**, American bandmaster who wrote many inspiring marches

**SOUTH.** See COLONIAL LIFE IN AMERICA (beginning with Southern Homes); COTTON (Where Cotton Is Produced).

**SOUTH, UNIVERSITY OF THE**, is a liberal arts and theological school for men in Sewanee, Tenn. It is controlled by the Protestant Episcopal Church. The average yearly enrollment at the University of the South is about 350.

**SOUTH AFRICA, UNION OF.** See UNION OF SOUTH AFRICA.

**SOUTH AFRICAN REPUBLIC.** See TRANSVAAL.

**SOUTH AFRICAN WAR.** See BOER WAR.



U & U

## SOUNDING



### LINE AND PLUMMET

A lead weight attached to a line marked in fathoms was lowered over the ship's side in the early days of sounding.



### Echo Wave

### SOUNDING

Echoing waves are formed when sound waves strike a solid object and are reflected back.

# SOUTH AMERICA



Kurt Severin, Black Star; Pix

**SOUTH AMERICA** is the fourth largest continent. It takes up nearly one seventh of the land area of the world.

South America forms the southern half of what we call the New World. Much of the continent is wild and empty. Other areas are fully civilized. South America is a land of vast plains, towering mountains, ragged villages, and modern cities. It is a land where the owners of great estates live like the barons of the Middle Ages. It is also a land where millions live in the greatest poverty. The highly civilized life of the great cities contrasts with the simple ways of the country folk.

The southern continent, together with Mexico and the countries of Central America and the West Indies, is sometimes called *Latin America*. Many of the people of South America speak either Spanish or Portuguese, which are Latin languages, and follow the customs of the Latin countries of the Old World. But a large number of the people still speak various native Indian languages and know very little of the Latin culture. This group of people is so large that some persons have suggested the name *Indo-America* would be more accurate than *Latin America*.

## The Land

**Size and Location.** South America is widest in the north. The continent narrows to the south, and ends in the narrow neck of land called the Horn, or Cape Horn. Much of its area lies within the tropics. But the southern part of the continent extends down through the Temperate Zone and reaches farther toward the South Pole than any other continent except Antarctica. For the boundaries of South America, see the colored map.

South America is much broader than the part of the South Atlantic Ocean which separates the closest points of Africa and South America. It lies much farther east than North America. Ninety-five per cent of South America is east of a line drawn south from New York City.

**Coast Line.** The coast line of South America is remarkably regular, except for the southern part of the western coast. Here the coast line is bordered by islands and cut by many deep fiords, or inlets. But small indentations all along the coast have formed famous harbors. Rio de Janeiro, on the eastern coast, has one of the most beautiful harbors in the world. Valparaiso on the western coast and Cartagena on the northern coast also have fine harbors.

Buenos Aires, the capital and chief port of Argentina, is situated on the southwestern side of the mouth of the Plata River. Montevideo, the capital and chief port of Uruguay lies on the northeastern side of the same river mouth. Other important ports include São Paulo (Brazil), Callao (Peru), Guayaquil (Ecuador), Buenaventura and Barranquilla (Colombia), and La Guaira (Venezuela).

**Islands.** There are not many islands off the coast of South America. Trinidad, off the northern coast, is one of the most important. The Strait of Magellan separates Tierra del Fuego (Land of Fire) from the southern tip of the mainland. The Falkland Islands lie east of the southern end of the continent. The Galapagos Islands are on the equator, west of the mainland.

A broad chain of islands lies off the western coast from 41° south latitude to Cape Horn. Geologists think these islands are the tops of ancient mountains. Marajo, an island about the size of Denmark, lies in the mouth of the Amazon River.

**Surface Features.** South America has some surface features like those of North America. The most striking resemblance is in the great mountain system that extends along the western side and forms the backbone of the continent, as the Rocky Mountains do in North America.

This majestic mountain system of South America is

## Facts in Brief

**Extent:** Area, 6,814,000 square miles. Greatest length, 4,800 miles; greatest width, 3,300 miles. Latitude, 12°N. -55°S.; longitude, 82°W.-35°E., Coast line 15,632 miles.

**Physical Features:** Chief mountain ranges, Cordillera de los Andes, Cordillera Central, Cordillera Occidental, Cordillera Real. Chief peaks, Aconcagua (22,834 feet), Ojos del Salado (22,573 feet), Falso Azufre (22,277 feet). Chief rivers, Amazon, Orinoco, São Francisco, La Plata, Paraná, Paraguay, Uruguay, Pilcomayo. Chief islands, Trinidad, Tierra del Fuego, Falkland Islands, Galapagos Islands. Chief gulfs, Gulf of Darien, Gulf of Maracaibo, Gulf of Saint George, Gulf of Guayaquil, Gulf of Panama. Chief waterfalls, Angel, Venezuela (5,500 feet); Kukenam, British Guiana (2,000 feet); Roraima, British Guiana (2,000 feet); King Edward VIII, British Guiana (840 feet); Tequendama, Colombia (450 feet).

**Population:** 88,680,000. Density, 13 persons per square mile.



known as the Andean Cordillera, or the Andes. Only the Himalaya Mountains of Asia are higher. Aconcagua, in Chile, is the highest peak of the Andes. It rises 22,834 feet above sea level. Ojos del Salado, on the Argentine-Chilean frontier, is 22,573 feet in height. Near-by Falso Azufre is 22,277 feet high.

In places this great mountain chain opens into several parallel ranges, like the fingers of a hand. Deep valleys lie in the openings, especially in Colombia and Venezuela. Pleasant open plains sometimes top the mountains. There are a number of large volcanic craters. The highest volcano is Chimborazo (20,702 feet) in Ecuador, near the equator. Some mountain lakes lie high among the greatest peaks. Large numbers of persons, mostly Indians, live on the plateaus.

*Natural Regions.* Narrow plains run along the coast between the Andes and the Pacific Ocean for a distance of about 4,000 miles. In some places these plains are broken by mountains that come down to the sea. The plains are never more than 100 miles wide.

These lowland coastal areas are very wild at the far ends of the continent. They are drenched with many rains, and are heavily forested. Few persons live in these places. But in the middle section of the coast there are desert lands which have been made productive by the use of mountain streams for irrigation. Mines have been developed in some of these productive plains, and there is a large population.

The jungles of the Amazon basin and the great treeless plains, or *pampas*, lie on the eastern side of the continent. There would be room for nearly all the large countries of Europe on the plains of Argentina alone. Brazil is larger than the United States, and only a little smaller than the entire continent of Europe.

Like North America, South America has low mountain regions near the Atlantic Coast. These are called the Guiana Highlands and the Brazilian Highlands. The Amazon River basin takes up the central part of the continent. It is an immense plain that has a rainy equatorial climate and is covered with dense tropical forests. This basin is thinly inhabited by people who hunt and fish, or who gather rubber, Brazil nuts, and other forest products. Fierce Indian tribes which have

never been conquered live far back in the Amazon basin.

A second lowland region lies north of the Amazon basin, and partly separated from it by the Guiana Highlands. This region is also tropical, but the land is covered with grass and there is a long dry season as well as a rainy season. These tropical grasslands are known as *llanos*. They support some cattle and are thinly settled by ranchers.

A third lowland region lies south of the Amazon Basin and is partly separated from it by the Brazilian Highlands. It reaches south beyond the tropics into the Temperate Zone. This region contains the fertile plains of the pampas, where enormous quantities of food crops and livestock are produced. Millions of white persons live in the region.

The Guiana Highlands are unproductive, hard to reach, and thinly settled. The Brazilian Highlands on the inland side are thinly populated grasslands called *campos*. But their seaward side, near the Atlantic, is fertile, easily reached, and the most thickly peopled region of South America. People of Negro and mixed stocks, as well as immigrants from Europe, live and work in this region. Coffee, cacao, sugar, cotton, and oranges grow here in abundance.

**Rivers and Lakes.** The river system of the Amazon is the largest in the world. It drains nearly a third of the entire continent and carries an enormous volume of water from the Andes and the central lowlands to the Atlantic. The drainage system of the Amazon River covers an area almost as large as the whole United States. Its waters are swelled by more than fifteen branch rivers. Each of these is more than a thousand miles long.

The Orinoco River lies north of the Amazon and drains the Llanos. The Rio de la Plata lies south of the Amazon. It is fed by the Paraná, Paraguay, and Uruguay rivers, and with them drains the southern lowland plains. The Magdalena flows into the Caribbean, the Guayas into the Pacific, and the São Francisco into the Atlantic. These and many smaller rivers are lines of transportation and settlement into the interior.

Unlike North America, the southern continent contains few large lakes. Lake Titicaca, high on an Andean

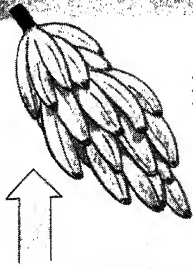
**Shooting Fish with Bow and Arrow Is a Highly Developed Art among the Indians of the Amazon Valley**

William LaVarre, Gendreau



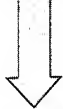
# SOUTH AMERICA

## Comparisons and Contrasts



EQUATOR

About 2/3 of South America is in the tropics.



Cool

Moderate

Hot

The temperature is generally the same throughout the year. The highland regions are cool and the lowlands are hot.



The black area indicates dense unpenetrated jungle. The hot climate and lack of transportation are the main reasons for its slow development.



South America is one of the largest undeveloped areas in the world. Its natural resources make it a huge treasure chest of potential wealth.

The Andes Mountains are the second highest range in the world.



The Amazon River system is the largest in the world. The amount of land drained by this system is equal to an area about 5/6th the size of the United States.



1,800 miles from Africa. Less than 1/2 the distance between the United States and Europe.

Greatest continuous forest area in the world.

Heaviest Populated Area

South America's Highest Mountain  
Aconcagua  
22,834 ft.

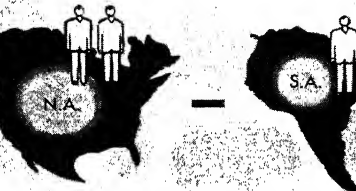


Buenos Aires is the largest city. It is about the size of Philadelphia.

Tierra del Fuego  
"The Land of Fire"



Antarctica is about 700 miles south of Tierra del Fuego.



South America is almost as large as North America but has only about 1/2 the population.

S.A.

Rest of Land Area

About 1/7 of the world's land area is contained in this tropical, triangular continent.

plateau, is the largest body of water in South America.

Lagoa dos Patos and Lagoa Mirim are the most famous lakes in Brazil. Lagoa dos Patos is 124 miles long and 37 miles wide. Southern Argentina and Chile have a lake region which is one of the most beautiful in the world. It is often called "The Switzerland of America."

**Climate.** The winters in the South American Temperate Zone are much warmer than in North America or Asia, and the summers are much cooler. The seasons are the opposite of those in the Northern Hemisphere. Summer lasts from December to February, and winter from June to August.

All South America north of Rio de Janeiro lies within the tropics. The weather in the valleys is very hot throughout the year, but in the uplands it is always cold. The people are classified more by where they live than by the race to which they belong. They are called "cold country" or "hot country" people.

The differences in climate from the highlands to the lowlands cause great differences in the appearance of the land. Patches of wheat and flocks of grazing sheep and llamas are seen on the uplands. Coffee and pineapple plantations appear at lower levels, and orange trees glow with bright-colored fruit. Farther down are the hot lands, with great fields of sugar cane and tobacco.

The extremes of rainfall are greater in South America than in North America, both from season to season and from place to place. In the tropics there are rainless deserts along the Pacific lowland, and rain-drenched forests in the lowlands of the Amazon. The llanos and the campos are wet and dry in turn, depending on the season. The temperate southern end of the continent has cool rainy slopes on the Pacific side and dry areas on the Atlantic side. A little farther north there is moderate rainfall both on the Pacific side and in the pampas on the Atlantic side.

### Natural Wealth

**Plant Life.** Heavy plant life covers the rainy tropical lowlands. It includes many kinds of plants. Some of these grow very large. The tropical forests called *selvas* which cover most of the Amazon Basin make up the greatest area of continuous forest in the world.

These inland forests of tall trees and thickly draped vines are crowned by a thick always-green covering of

leaves. The forest floor is so completely cut off from sunlight that the undergrowth is not heavy. But the forest fringes along streams and clearings get more sunlight. There the undergrowth is so heavy that it is almost impossible to break through it.

Many different kinds of trees grow in these forests. Some are the source of valuable products. The forests yield rubber and other gums for special uses, Brazil nuts, and *cinchona*, from which quinine is made. Palm and bamboo trees are common, but most of these forests get so much rain that mahogany and other cabinet woods will not grow in the warm, moist atmosphere.

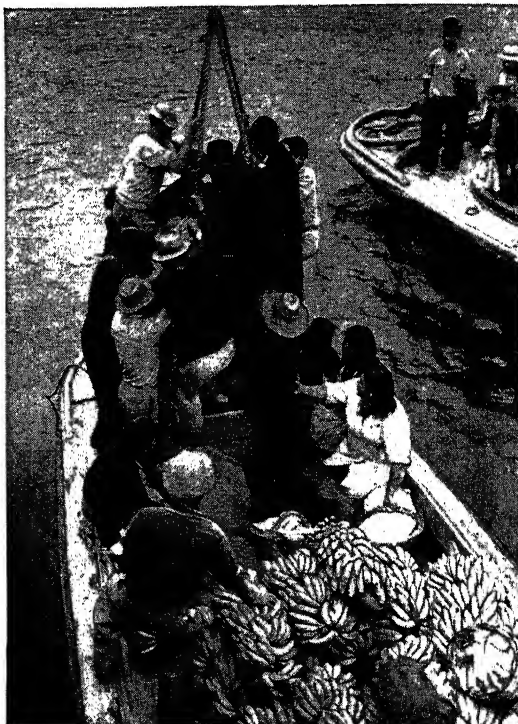
The heat and rainfall are greatest in the equatorial forests, and have created a special type of plant life there. Different conditions have produced different kinds of plant life both north and south of this area. Some areas have tropical forests which shed their leaves during a short dry season. Other areas have a long dry season. Bushy woods and grasslands cover these areas.

Still different kinds of bushes and grasses grow on the cold heights of the Andes, above the timber line. The southern part of the continent is carpeted with the kind of forests and grasslands found in most temperate climates.

In certain places there are wild plants which have special values. These include the plant called *yerba maté*. The leaves of this plant are used to make the famous maté, or Paraguay tea. Paraná pine for lumber grows in the subtropical forests.

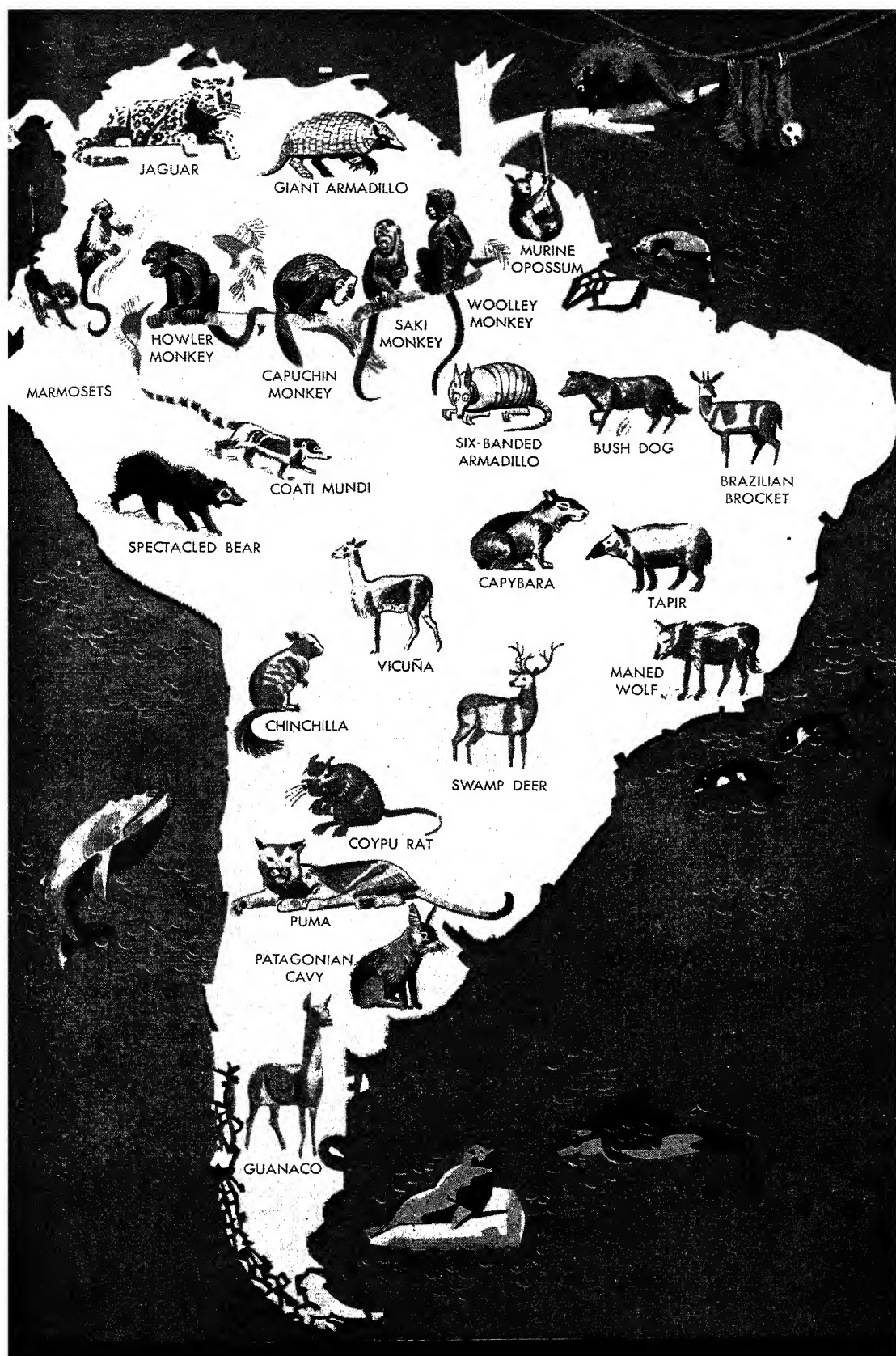
The settlers in every region grow many cultivated plants. The settlers have carefully selected these plants for the kind of climate in which they will have to grow. For example, bananas thrive in the rainy tropical lowlands. Coffee grows best on low plateaus, while wheat requires high plateaus or the lowlands of the Temperate Zone.

**Animal Life.** South America has a great variety of animal life which is different in many ways from that of North America. Many of the kinds of animals which live in South America are found nowhere else in the world. About a fourth of all the known kinds of mammals in the world live in South America. There are several kinds of monkeys. Two of these are different from any found in the Old World. South and Central America have certain kinds of mammals which are not found on the other continents. These include certain



De Palma, Black Star

**A Cargo Sling of Bananas** is hoisted from a small boat into the hold of a steamer in the harbor at Mollendo, Peru. Bananas are one of the leading South American products. Both men and women assist in the work of loading.



JAGUAR

GIANT ARMADILLO

MURINE  
OPOSSUM

HOWLER  
MONKEY

SAKI  
MONKEY

WOOLLEY  
MONKEY

MARMOSETS

CAPUCHIN  
MONKEY

SIX-BANDED  
ARMADILLO

BUSH DOG

BRAZILIAN  
BROCKET

COATI MUNDI

SPECTACLED BEAR

CAPYBARA

TAPIR

VICUÑA

CHINCHILLA

MANED  
WOLF

SWAMP DEER

COYPU RAT

PUMA

PATAGONIAN  
CAVY

GUANACO





**Stock Raising Is a Leading Industry** on the plains and plateaus of South America. Fur riding trousers, or chaps, such

as this cowboy wears on a ranch in Ecuador, were once a common sight on the western plains and ranges of the United States.

toothless animals, such as vampire bats, sloths, anteaters, and armadillos. The tapir is the largest native mammal.

South American jaguars are savage. The jaguar is a leopardlike animal, and the most powerful of the continent's flesh-eating animals. It is the only dangerous beast of prey in South America. The continent has few of the wild animals found in Asia and Africa.

The tropical regions have many small jungle animals and bright-feathered birds. Flamingoes, toucans, egrets, hummingbirds, and a great variety of parrots mingle their brilliant colors with the rich green of the jungle. There are also many kinds of large, colorful butterflies. South America has many kinds of beetles. Some of these grow very large. Among the reptiles are alligators, boa constrictors, and turtles. The rivers have many fish. The number and variety are greater than in North America.

In addition to wild animals there are many domestic animals in every region. Horses, cattle, sheep, and goats are among those that have been brought in from other continents. The *llama* and the *alpaca*, which are both related to the camel, are the only native wild animals which have been tamed for domestic use in South America. Argentina is one of the greatest cattle- and wool-producing countries in the world.

**Mineral Wealth.** Native Indians have worked the rich gold and silver mines of South America since very early times. These fabled mines attracted many early European settlers to the continent. The Potosí silver mines of Bolivia produced a wealth of more than \$2,000,000,000 from the time they were discovered. In many years the annual production of the gold mines of Brazil is worth more than \$6,000,000. There are also fairly large deposits of gold and silver in Colombia, Venezuela, and the Guianas.

Precious metals are still produced from a few mines in the Andes, the Guiana Highlands, and the Brazilian Highlands. But other minerals have proved a greater source of wealth. In the Andes these include industrial

metals, such as copper, tin, platinum, and iron. Chemical resources, such as nitrate and guano, are found in the Pacific coastal desert. Petroleum is taken from wells in Venezuela, Colombia, Argentina, and Peru.

Vanadium is mined in Peru, antimony and tungsten in Bolivia, and bauxite in Guiana. Manganese is found in Peru, Bolivia, Chile, and Paraguay. Chromite, tantalite, and quartz crystal are mined in Brazil, and mica is found in both Brazil and Colombia. The coal mines of Colombia are very important. Brazil has enormous deposits of monazite, cement gravel, iron, and coal, and began the commercial production of petroleum in 1940.

Many precious stones are mined in South America. White men have worked the Muzo emerald mines in Colombia for more than four hundred years, and the Indians worked them long before the Spanish conquest. Brazil has several diamond mines, and exports diamonds for industrial use.

### The People

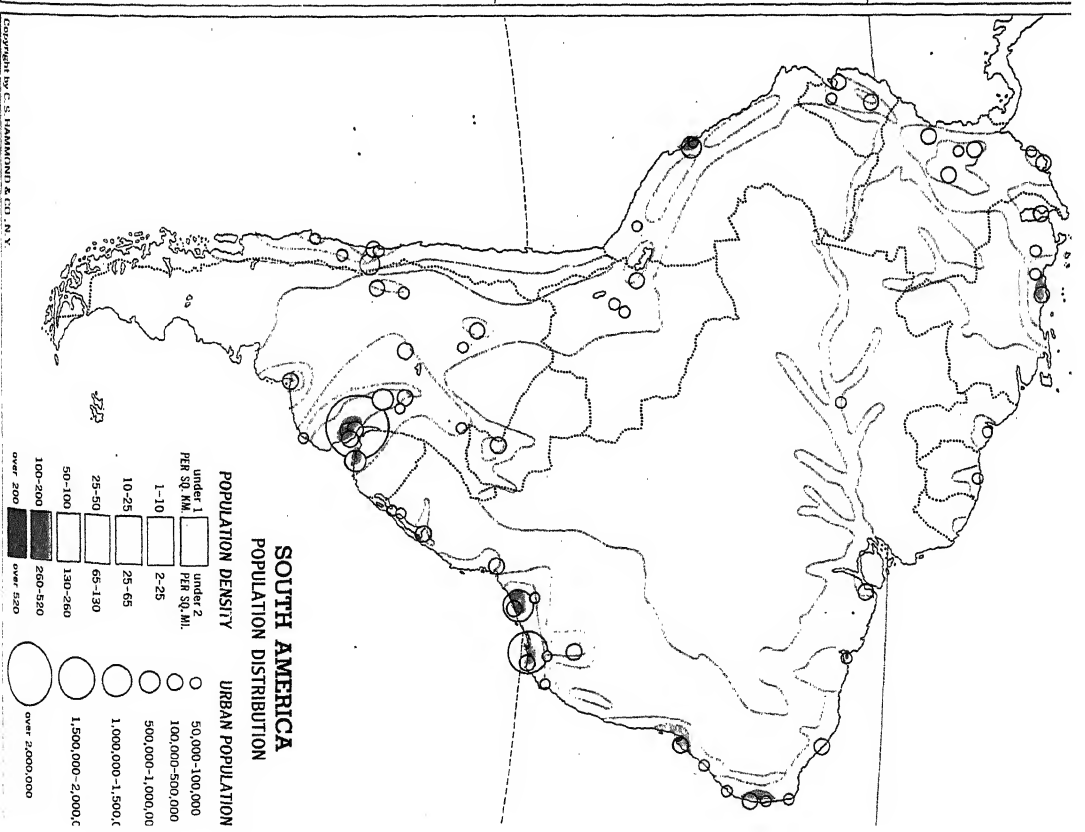
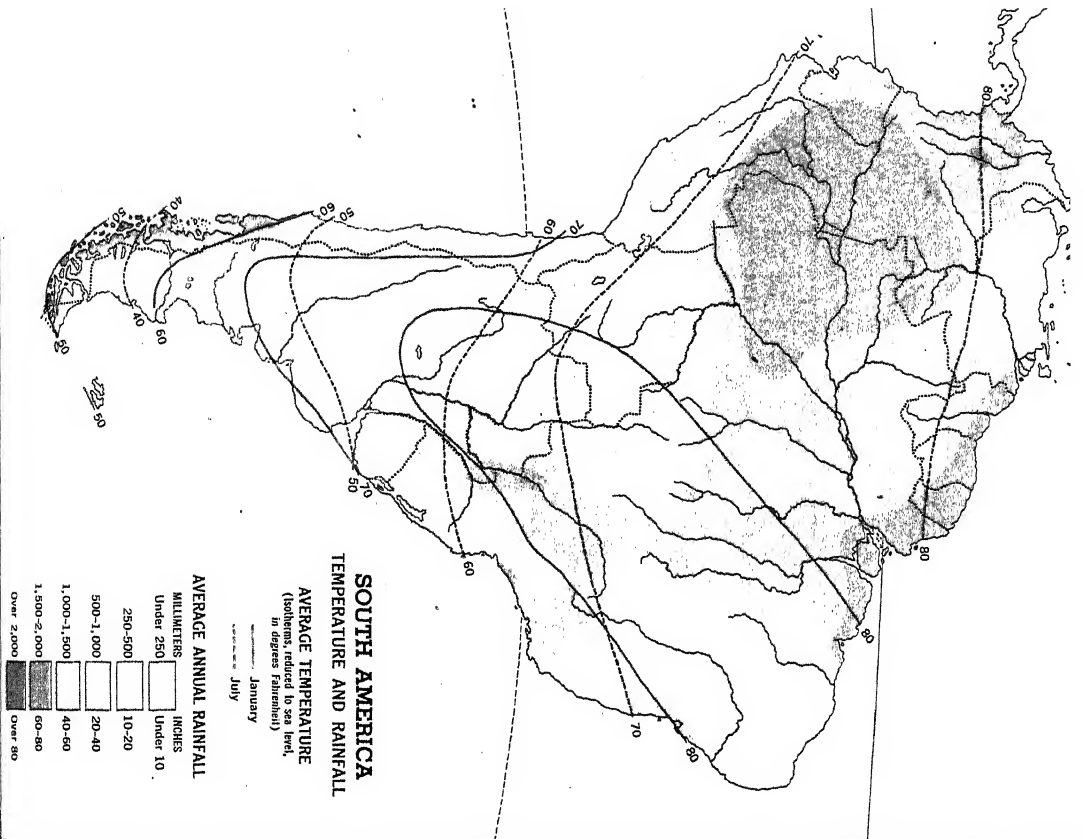
**Native Peoples.** South America was inhabited by various Indian peoples in very early times. When the first white men came to South America, they found Indian tribes and races scattered far and wide throughout the continent. Some of the Indian peoples had developed remarkable civilizations, such as the one found in Peru. Other Indians lived a simple, primitive life, just as many still do today. The Indian stock is the basic stock of South America. It greatly outranks all other strains.

**The People Today.** South America is only slightly smaller than North America, but it has only about half as many people. A number of races make up its population of about 88,680,000 persons.

Some South American cities are almost entirely inhabited by white people. Others are made up chiefly of Negroes or Indians. These peoples have mingled with each other and with white people. Mixed stocks include the *mestizo*, who is part white and part Indian, and







the *zambo*, who is of mixed Indian and Negro ancestry.

Argentina has no Negroes. Only two out of a hundred of the people have traces of Indian strains. Most Argentines are descended from European peoples. Brazil has almost five million Negroes. In Bolivia, another of Argentina's neighbors, more than half of the people are Indians. About thirteen out of every hundred persons of Bolivia are white. The rest are mestizos.

In Peru, about half of the people are whites or mestizos. One third are Indians and the rest are Negroes and Asiatics. The mestizos outnumber all other people in Colombia and Paraguay. In Colombia the mestizos are more white than Indian, while in Paraguay, the mestizos are mostly Guarani Indian.

Many modern immigrants from Italy, Spain, Germany, Poland, and other countries have settled in South America. Most of these immigrants live in the countries on the Atlantic Coast, which include Argentina, Brazil, and Uruguay. But a strong German colony has been established in Chile, on the Pacific Coast. The greatest cities lie on the Atlantic shore. The inhabitants of the Atlantic Coast do not often venture into the mysterious jungle or onto the empty pampa. They cluster about the seaports.

There is little discrimination against Negroes and Indians, but there are the greatest differences between the living conditions of different groups. Small ruling classes control the various so-called republics, where many millions live in poverty and ignorance.

Spanish is the official language of nine of the republics of South America. Portuguese is the official language of Brazil. Most of the people in South America are Roman Catholics.

### The Life of the People

Most of the people of South America are farmers or miners. Their history has been one of little cities lost in the hills, of great farms where peasants do their work in silence, and of petty chieftains who have led their bands from one province to another, like the barons of the Middle Ages.

The early Spanish settlements had little means of communication, and many were separated by vast distances. During the 1800's, railroads and highways began to unite these far-flung provinces. At first the railroads were only spur lines. These short lines began to link up

about 1910. The business centers of the continent were soon bound together by modern rail lines. The influence of the more progressive cities began to make itself felt. Sleepy little villages grew into busy cities. Engineers tore down some of the ancient Spanish towns, and new cities arose where old ones had once stood. All the capitals of South American countries are now new cities of this type.

**Clothing.** Most South Americans are too poor to spend much money on clothing. But heavy clothing is not needed in the mild climate of much of the continent. In the lowlands, the Indians and poor people wear very few clothes. But people living in the mountains and on the high plateaus have to bundle themselves up in heavy clothes and shawls. In the cities the people dress much as North Americans do.

**Shelter.** South American homes vary from roomy well-heated modern houses to the flimsiest shacks of the tropics. The wealthy landowners are proud of their great rambling country houses. The homes in the cities are much like those in North America and Europe. The temperate regions in the south have solid houses of brick and stone.

The poor country people of South America live in flimsy houses and wooden huts. Fortunately, good houses are not so necessary in a warm climate. Tropical rains often flood the lowlands, and protection from flood waters is more important in these regions than protection from the cold. Houses in the wet tropics are often built on high stilts to keep them above the floodwaters.

**Food.** South America produces more food than it can use. But many of the people live on a very poor diet. This is due to poor distribution and various local conditions. South American beef and grains form a large part of the food of Europe. Wheat, corn, and cacao (from which cocoa is made), are grown and exported in great quantities. South America is also the world's greatest producer of bananas and coffee. Some food crops, such as wheat and rice, have been introduced from other continents. Other food crops, such as potatoes and corn, were developed from wild plants by the early Indians.

### The Countries of South America

There are ten republics on the South American Continent. Foreign countries hold only small islands and bits of the mainland as colonial possessions. British



Guiana, Surinam, and French Guiana are the only foreign possessions on the continent. The South American republics have joined with the other Latin American republics and with the United States to form the Pan American Union.

The following table gives some facts concerning South American countries. An article on each country will be found in *THE WORLD BOOK ENCYCLOPEDIA*.

COUNTRY	AREA IN SQUARE MILES	POPULA- TION	FORM OF GOVERN- MENT
Argentina	1,079,965	14,130,871	Republic
Bolivia	506,792	3,595,700	Republic
Brazil	3,275,510	45,300,000	Republic
British Guiana	89,480	367,204	British colony
Chile	286,322	5,191,027	Republic
Colombia	439,997	9,807,000	Republic
Dutch Guiana or Surinam	54,291	191,628	Nether- lands colony
Ecuador	275,936	3,106,000	Republic
French Guiana	34,740	30,876	French colony
Paraguay	153,447	1,141,332	Republic
Peru	482,258	7,271,654	Republic
Uruguay	72,153	2,235,000	Republic
Venezuela	352,143	3,850,771	Republic

### History

Christopher Columbus was the first white man to reach South America. In 1498 during his third voyage of exploration, he visited the island of Trinidad and reached the South American mainland at the mouth of the Orinoco River. In 1502 Columbus returned to South America on his fourth voyage. He reached the mainland again, and sailed along the continent from Cape Honduras to Darien, in what is now Colombia.

In 1499 Alonso de Hojeda, a Spanish navigator, sailed along the mainland from near the equator to Cape La Vela, Colombia. From 1500 to 1502 Rodrigo de Bastidas and Juan de la Cosa sailed along the Caribbean shore of Colombia and Panama. Vicente Pinzon also reached the mainland early in 1500. He followed the coast southward into the mouth of the Amazon, and then continued down the coast until he reached a point on the great eastward bulge of Brazil.

Portuguese explorers followed soon after the Spaniards. Pedro Alvarez Cabral arrived off what is now Brazil in 1500, and explored the coast. He took possession of large areas of Brazil in the name of Portugal. Amerigo Vespucci, whose name was later given to all the New World, was a member of exploring parties which continued these explorations and claimed new lands for Portugal.

These early explorers were seeking a direct route to India. They were more interested in the route to India than in the geography and resources of this new continent, with all its unknown wealth.

In 1513 Vasco Núñez de Balboa fought his way through the jungles of Panama, in Central America, and discovered the Pacific Ocean. Eight years later Ferdinand Magellan sailed around the southern end of South America and headed out into the unknown Pacific. His voyage opened the long-sought route to the Far East.

Adventurous Europeans now began to invade the new continent. The conquest and colonization of South America followed a different course from that used a hundred years later in North America. The North American colonies were first strongly established along the seaboard. Solid bases for expansion were built, and then, little by little, the frontiers were pushed westward. The colonization came first, and then the conquest.

But in South America, the conquest came first. Forty years after Columbus discovered the New World, the Spaniards and Portuguese had gone deep into South America and had laid there the foundations of their cities. Francisco Pizarro conquered Peru between 1531 and 1534. His companion, Diego de Almagro, carried the Spanish colors far into Chile. In 1534 Sebastián de Benalcázar conquered the land of present-day Ecuador. Jiménez de Quesada conquered what is now Colombia between 1536 and 1538.

In 1534 Pedro de Mendoza led a colonizing expedition into the Plata River region. Five years later Martínez de Irala pushed on into what is now Paraguay. In 1541 Francisco de Orellana crossed the mighty Andes from the Pacific Coast, and followed the Amazon River from its headwaters to its mouth on the Atlantic Ocean.

While the Spaniards explored the continent from west to east, the Portuguese explored it from east to west. In 1531 they began the exploration of Brazil, and finally occupied the entire country. Spain and Portugal thus won control of most of South America. They held this control until early in the 1800's.

Many of the cities of South America are much older than those of North America. São Paulo, Brazil, was founded in 1532. Quito, Ecuador, was founded in 1534. Lima, Peru, and Buenos Aires, Argentina, were established in 1535. Pernambuco, Brazil, was founded in 1536, and Bogotá, Colombia, in 1538. Santiago, Chile, was founded in 1541, and La Paz, Bolivia, in 1545.

As the new Latin and Catholic nations of South America grew into maturity, they began to resent the rule of distant Spain. Beginning in 1810 the Spanish colonies one by one threw off the Spanish rule.

Simón Bolívar, who is known in Latin American history as "The Liberator" led the struggle for independence. He was aided by José de San Martín, who helped drive the Spanish armies from Argentina, Chile, and Peru. After a long struggle, Spain formally recognized the independence of the new republics in 1826. Brazil broke away from Portugal in 1823, and set up an independent monarchy which lasted until the republic of Brazil was established in 1889.

The new republics were troubled by revolutions throughout most of the 1800's. This lack of stable government hindered South American progress. But gradually the capacity for orderly self-government began to develop. Political conditions became more settled. A great economic development is taking place as the natural resources of the continent are opened up. But government by men rather than by laws, is still common in South America.

The South American countries generally sided with the Allies during World War II. All of them finally broke relations with the Axis, although Argentina did not make a definite break until March, 1945. Some of

the countries, including Argentina, declared war. A Brazilian Expeditionary Force landed in Italy in July, 1944, and a month later joined the United States Fifth Army in war operations. President Franklin D. Roosevelt kept in close communication with his country's southern neighbors throughout the war. His administrations were marked by very favorable relations between the United States and South America. G.A.

**Related Subjects.** The reader is also referred to:

**CHARACTERISTIC ANIMAL LIFE**  
See also ANIMAL (color plates)

Agouti	Coati	Motmot
Alpaca	Cock of the Rock	Peccary
Anaconda	Condor	Rhea
Anteater	Guanaco	Sloth
Armadillo	Harpy (eagle)	Tanager
Bellbird	Hoatzin	Tapir
Boa Constrictor	Jaguar	Toucan
Capybara	Kinkajou	Umbrella Bird
Caracara	Llama	Vampire Bat
Cavy	Macaw	Vicuna
Chinchilla	Marmoset	

**CHARACTERISTIC PLANT LIFE**

Agrimony	Cherimoya	Pineapple
Bamboo	Cinchona	Quebracho
Brazil Nut	Guava	Tomato
Cannon-Ball Tree	Ivory Palm	Vanilla
Cashew	Petunia	

**CHIEF CITIES AND TOWNS**

For lists and descriptions of the cities and towns of South America, see the articles under *Political Divisions*.

**HISTORY**

For the history of South America, see the articles under *Political Divisions*, and the article on **LATIN-AMERICAN HISTORY**.

**ISLANDS**

Falkland	Juan Fernandez	Tierra del Fuego
Galapagos	Marajo	Trinidad

**LAKES**

Maracaibo	Titicaca
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**LEADING PRODUCTS**

Banana	Emerald	Petroleum
Beef	Gold	Rubber
Cacao	Guano	Silver
Coffee	Maté	Tin
Copper	Nitrate	Wool
Cotton		

**MOUNTAINS**

Aconcagua	Chimborazo	Cotopaxi
Andes	Cordillera	Illampu

**POLITICAL DIVISIONS**

Argentina	Colombia	Paraguay
Bolivia	Dutch Guiana	Peru
Brazil	Ecuador	Uruguay
British Guiana	French Guiana	Venezuela
Chile		

**RIVERS**

See the list at the end of the article **RIVER**.

**UNCLASSIFIED**

Dress (Latin America)	Magellan, Strait of
Horn, Cape	Pampas
Inca	Panama, Isthmus of
Latin America	Patagonia
Latin-American Culture	Selva
Llanos	

**Outline**

- I. **Introduction**
- II. **The Land**
  - A. Size and Location
  - B. Coast Line
  - C. Islands
- III. **Natural Wealth**
  - A. Plant Life
  - B. Animal Life
  - C. Mineral Wealth
- IV. **The People**
  - A. Native Peoples
  - B. The People Today
- V. **The Life of the People**
  - A. Clothing
  - B. Shelter
  - C. Food
- VI. **The Countries of South America**
- VII. **History**

**Questions**

How much of South America would lie east of a line drawn straight south from New York City?

What and where are the *pampas*? The *llanos*?

What is the continent's longest river? How large an area does it drain?

When it is winter in North America, what season is it in most of South America? Why?

What is *cinchona*? *Yerba maté*? How is each used?

For how long have the gold and silver mines of the continent been worked?

What South American minerals are most valuable today?

What language is spoken throughout most of South America? Where is Portuguese the official language?

What are the only foreign possessions on the continent?

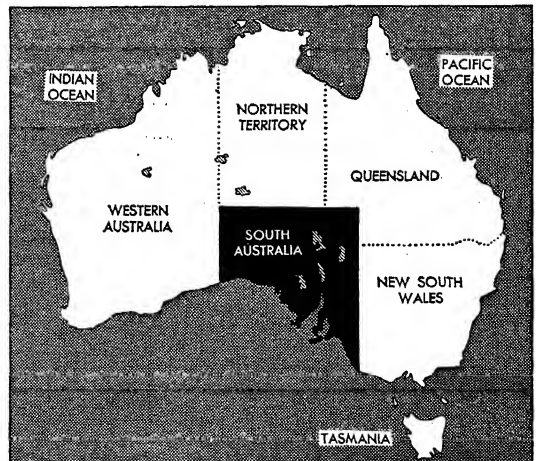
**SOUTHAMPTON.** See **ENGLAND** (Cities).

**SOUTHAMPTON, EARL OF** (1573-1624). See **SHAKESPEARE, WILLIAM** (Poet).

**SOUTH ATLANTIC STATES.** See **UNITED STATES** (Location and Size).

**SOUTH AUSTRALIA** is a state in south-central Australia. It faces the Southern Ocean and the Great Australian Bight, and reaches 800 miles back into the continent. South Australia was almost unexplored a hundred years ago. Today it is a modern and prosperous state of the Australian Commonwealth.

**The Land and Its Resources.** South Australia covers an area of 380,070 square miles. This is greater than the area of the states of Texas and Colorado put together.



**Location Map of South Australia**





Australian News &amp; Information Bureau

**Trucks Piled High with Grapes** from South Australian vineyards line up at a winery, awaiting their turn to unload. Wine

making is an important industry in the state. The warm, sunny climate is ideally suited to grape growing.

Much of the land area of the state is from 1,000 to 2,000 feet above sea level. The Gawler and Flinders ranges rise in the southern part of the state, and the Musgrave Ranges in the north. The beautiful Mount Lofty Range is only a short distance from Adelaide, the capital. Mount Woodroffe (5,120 feet) in the Musgrave Ranges is the highest point in the state.

Gulfs and bays cut deep into the coast of South Australia. The largest of these are Spencer's and Saint Vincent's gulfs, which are separated by Yorke Peninsula. The Gulf of Saint Vincent is partly shut off by Kangaroo Island, the largest island of Australia except for the island state, Tasmania.

The most fertile areas of South Australia lie near Adelaide and on the southeastern coast. This is a region of great vineyards and orchards. To the north, wheat farms and rolling plains stretch between the blue mountain ranges. Farther north, the plains are flat, sheep-grazing lands. At the edge of the sheep country are sandy deserts which extend into the center of the state.

The northern part of the state reaches into the deserts of central Australia. In the far north is a region which is somewhat like the Grand Canyon country of North America. Great rocks tower over the plains, and the scenery is rich in color and lonely grandeur.

The western section of the state is barren. Much of it is covered by the Nullarbor (treeless) Plain. This is dry, flat, wind-swept country covered with stunted bushes a few inches high. Trees cannot take root because beds of limestone lie only a few inches below the surface.

The people who live on the Nullarbor Plain are mostly workers who care for the trans-Australian railroad and telegraph lines. Strong winds blow continually. Almost every roof-top has a wind-motor to generate electricity for use in the home. Great caves and blow-holes are scattered over the plains. Some of these vast

underground passages have not been fully explored.

**Rivers and Lakes.** The Murray River is the largest in Australia. It flows across the southeastern part of the state and into the Southern Ocean. Many smaller rivers flow into Lake Eyre, in the northeastern part of the state. During the dry season, this lake shrinks greatly in size. The rivers which flow into Lake Eyre often dry up through evaporation and seepage before they reach the lake.

Cooper Creek runs from Queensland into Lake Eyre, and the Warburton River flows in a southwestward course into the lake. Other streams drain into the lake from the Musgrave Ranges in the northwestern part of the state. Lake Torrens and Lake Frome were once great bodies of water, but are now usually dry.

**Climate.** The climate is hot and dry, but it is also healthful. There is enough rain to grow crops along the southern coast and in the highlands, but the annual rainfall in the interior is only from five to eleven inches.

**Natural Resources.** South Australia is rich in natural resources in spite of its wide wastelands. A large part of the land is suitable for grazing. With irrigation, it can also be farmed. Salt is taken in great quantities from the shallow salt lakes. The eastern mountain ranges contain large deposits of ironstone, crude salt, limestone, gypsum, phosphate rock, opals, and manganese ore.

**The People.** South Australia has a population of 620,000. Three out of five persons live in Adelaide and the surrounding region. Most of the people are of British birth or descent, but there are some Germans, Scandinavians, and other Europeans, as well as natives, or aborigines, in the northern part of the State.

**Agriculture.** South Australia is an agricultural state. Large crops of wheat, barley, oats, hay, and potatoes are raised in the southern and eastern sections. Farther north, irrigation has made many miles of dry grasslands into fertile vineyards, orchards, and orange groves.

Six out of every ten acres of land in South Australia are put to some use. Grazing leases account for three fourths of the used land. In a single year, as many as 10,000,000 sheep and 425,000 cattle graze on the plains of South Australia. More than 100,000,000 pounds of wool are produced annually.

**Minerals and Manufactures.** South Australia had few factories until World War II caused a swift industrial development. The town of Whyalla, near large deposits of iron ore, became an important steel-producing city almost overnight. The mines and quarries yield more than \$110,000,000 worth of products a year.

**Transportation and Trade.** The state has 3,861 miles of railroads, and over 50,000 miles of roads. The Murray River is navigable and carries a great deal of traffic. The chief exports are fresh and dried fruits, wine, meats, butter, wheat, flour, wool, and copper.

**Cities.** Adelaide, the capital, is described under its own name in THE WORLD BOOK ENCYCLOPEDIA. Port Pirie (population 11,680) is situated on Spencer's Gulf, and is the chief port of Southern Australia. Other important towns are Whyalla, Mount Gambier, Port Augusta, Gawler, and Renmark. None of these has a population of more than 8,000.

**Education and Religion.** Education in South Australia is free and compulsory. All children must attend school until they reach the age of fourteen. There is a good university at Adelaide, as well as a state school of mines and industries. South Australia has no state church, but more people belong to the Church of England than to any other.

**History and Government.** The government of South Australia is modern, democratic, and constitutional. The state has its own local parliament and state governor, and also sends representatives to the Australian Parliament at Canberra. The governor of the state is appointed by the King of England, but has little power. The elected parliament actually controls the state. Both men and women have the privilege of voting.

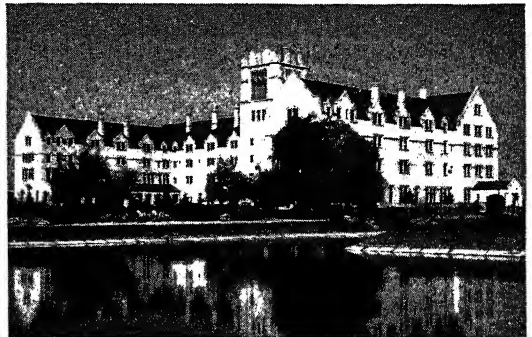
South Australia is a recently settled territory. Matthew Flinders, a British navigator, made the first extensive explorations and discoveries along the South Australian coast about 1802. In 1830 another British explorer, Charles Sturt, sailed down the Murray River and made further explorations. The first settlement was founded in 1836. The population grew rapidly after 1850. In 1901 South Australia joined with five other colonies to form the present Commonwealth of Australia.

The early settlers were middle-class and poor people from the overcrowded British Isles. They loved freedom and its institutions. As early as 1855 they introduced the secret ballot to promote a democratic form of government. South Australia became noted for its progressive government. Its prosperity increased through the years, until today it is a comfortable state where the people are neither very rich nor very poor. G.A.

**Related Subjects.** The reader is also referred to:  
 Australia Great Australian Bight  
 British Commonwealth of Nations Murray River  
 Nations Northern Territory  
 Cooper Creek  
 Flag (color plate, Flags of the  
 British Commonwealth of Nations)

**SOUTH BEND, Ind.** (population 101,268), is an important industrial center in north-central Indiana. It is the fourth largest city in the state. South Bend was so named because it lies at the southernmost point of the Indiana bend in the St. Joseph River. There are many industrial plants in South Bend, but the city is unusually clean. It has practically no slums.

South Bend lies about eighty miles east and south of Chicago. Mishawaka, a smaller city, lies on the eastern limits of South Bend. Notre Dame University, one of the best-known universities in the United States, is immediately north of the city. Thousands of persons come here every year to see the football games played in Rockne Stadium, a memorial to the famous coach, Knute Rockne. South Bend is also the home of an extension center of Indiana University. Saint Mary's College for girls is near South Bend.



South Bend Association of Commerce

**Saint Mary's College near South Bend, Ind.**, is a Roman Catholic girls' school located 3 miles from the center of town. It was founded in 1855 at the request of Father Florin, president and founder of near-by Notre Dame University.

**Industry.** South Bend owes its growth and prosperity mainly to manufacturing. It is the home of the Studebaker Corporation, makers of automobiles and trucks; the Oliver Farm Equipment Company, which makes farm machinery and tools; and the Bendix Aviation Corporation, makers of automobile and airplane brakes and accessories. The Studebakers were famous wagon-makers for fifty years before the manufacture of trucks and automobiles began on a large scale. A couplet of about 1890 ran:

"If it was a Studebaker wagon,  
 It was something he could brag on."

The Oliver family became famous as producers of the Oliver chilled plow in the same fifty-year period that the Studebakers were turning out wagons and early automobiles.

A large airport and other fine transportation facilities serve South Bend.

**History.** An Indian village first occupied the site of the city. South Bend was founded in 1823 by Alexis Coquillard, a fur trader who called it Big St. Joseph Station. The name was later changed to South Bend. In 1831 the trading village became the county seat of the new Saint Joseph County, created in January, 1830. The village was incorporated as a town in 1835 and became a city in 1865. South Bend has the mayor and council form of government. W.O.L.



Photos: Julien; Sawdara

## SOUTH CAROLINA THE PALMETTO STATE

**SOUTH CAROLINA**, *KAIR oh LI nah*, is the southern section of an area which was granted to Sir Robert Heath by King Charles I of England in 1629. The entire area was called "Carolina," and named after King Charles I. The northern part is now North Carolina. South Carolina is often called **THE PALMETTO STATE**, because of the palmetto trees which grow in large numbers along its coast, and because of a gallant incident which occurred during the Revolutionary War. On June 28, 1776, a handful of Americans, commanded by William Moultrie, defended the harbor against the fire of eleven British warships. The group made their stand in a half-finished fort made of palmetto logs and sand. The soft, spongy palmetto logs held firm as the cannon balls sank harmlessly into the sand. The Americans fired shot after shot and won a brilliant victory when the British fleet was forced to retire.

South Carolina is a land of rare beauty and charm. Its attractive scenery includes the high-forested hills of the Blue Ridge Mountains in the northwest, the palmetto groves and sand dunes of the barrier islands, the marshes of the Savannah River, where the snowy heron and white egret nest and feed, and the formal gardens of the seaport city of Charleston. In spring, the state is bright with the bloom of jasmine, azalea, magnolia, and camellia, and sweet with the song of the cardinal and the mockingbird. South Carolina also is rich in culture, history, and famous statesmen. The state lost its seaport, Charleston, and suffered a disastrous defeat at Camden late in the Revolutionary War. But its leaders, John Rutledge, Francis Marion, Thomas Sumter, and Andrew Pickens, never lost faith. They changed the course of the war at Cowpens and Kings Mountain, and speeded up the British retreat to Yorktown where Cornwallis finally surrendered to Washington. South Carolina proudly remembers its famous statesman, John C. Calhoun, who became the leading speaker for the South and its principle of states' rights. The state also recalls the opening fight of the War between the States at Fort Sumter, with all the brave, sad victories and many defeats that came after it.

According to an old South Carolina saying, "Charleston is the place where the Ashley and Cooper rivers meet to form the Atlantic Ocean." In the early years,

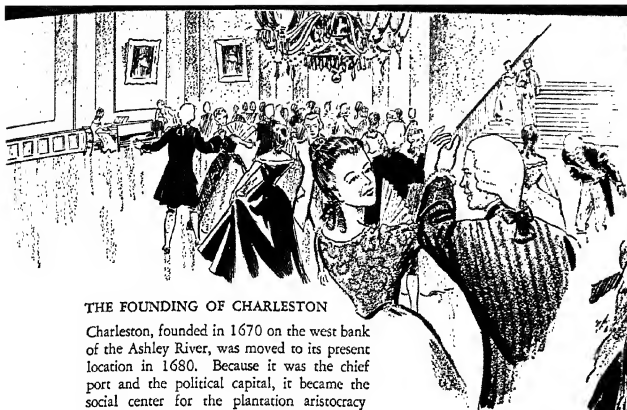
Charleston was a great seaport and trading center. All the crops of the interior as well as the rice and indigo of the tidewater region were exported through Charleston. The city was the leading meeting place of the most powerful political group, and the center of the social and cultural life of the Carolinas. The first free library was opened in Charleston as early as 1698. One of the first operas in North America was heard here in 1735. The first symphony and open-air concerts were given by the St. Cecilia Musical Society, which was organized in 1762. The first public museum in the colonies was established in Charleston in 1773, and a free school for whites was opened in 1710. Free instruction for Negroes began before 1750. The earliest fire-insurance company in the colonies was organized at Charleston in 1735, and the first fireproof building in the United States was built in this city in 1826.

The South Carolina colonists tried growing many crops, such as oranges, tea, olives, and mulberry trees for silkworm culture. They were very successful in growing rice and indigo, and these two products became their chief plantation crops. The earliest sea-island cotton was grown on the barrier islands along the coasts of South Carolina and Georgia. The cotton took its name from these islands. The first bales of sea-island cotton were exported in 1791. They were bought by Robert Owen, famous English mill owner. He used the long, fine cotton fibers to spin a thread of unusually high quality. Sea-island cotton immediately became a standard of fine cotton in the markets of the world.

Today, the state competes with North Carolina for first place in the manufacture of cotton goods. South Carolina has the largest cloth-bleaching works in the South, located at Rock Hill. One of the largest wood-

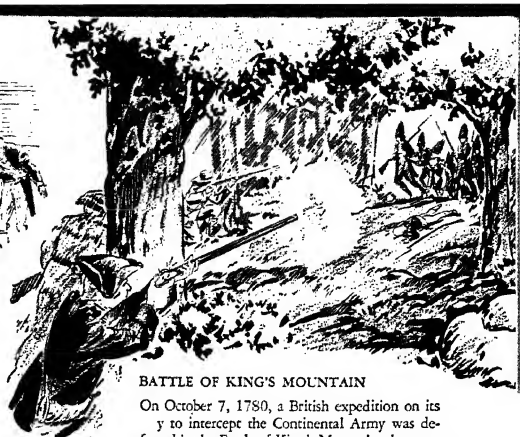
### Pronunciation Guide

Aiken <i>A ken</i>	Huguenot <i>HYOO geh naht</i>
Barbados <i>bahr BA dohz</i>	kaolin <i>KAY oh lin</i>
Beaufort <i>BO fert</i>	Moultrie <i>MOHL trih</i>
Cheraw <i>CHE raw</i>	Oconee <i>oh KO nee</i>
Dreher <i>DRAY her</i>	Saluda <i>sah LOO dah</i>
Edisto <i>ED is toh</i>	Waterree <i>WAW,ter EE</i>
Gullah <i>GULL ah</i>	



#### THE FOUNDING OF CHARLESTON

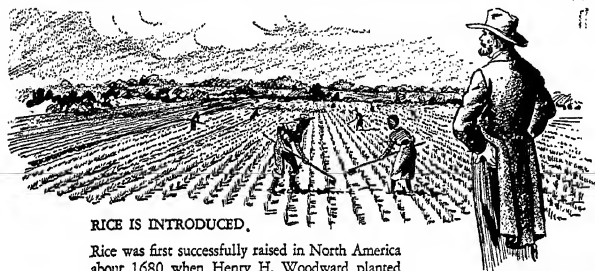
Charleston, founded in 1670 on the west bank of the Ashley River, was moved to its present location in 1680. Because it was the chief port and the political capital, it became the social center for the plantation aristocracy



#### BATTLE OF KING'S MOUNTAIN

On October 7, 1780, a British expedition on its way to intercept the Continental Army was defeated in the Battle of King's Mountain, the turning point of the Revolutionary War in the South.

## MEMORABLE SOUTH CAROLINA EVENTS



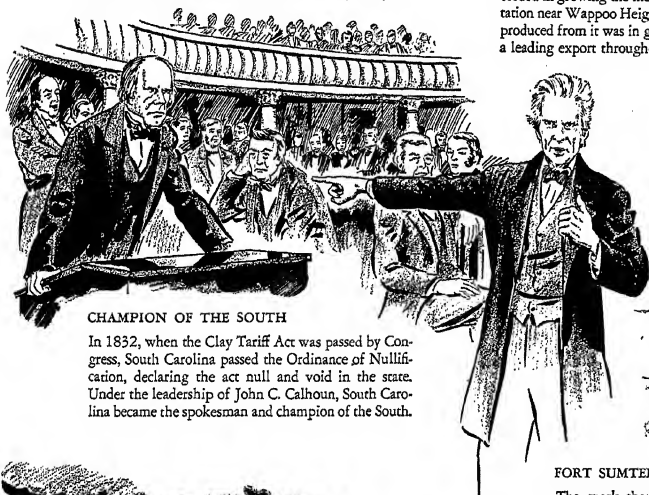
#### RICE IS INTRODUCED

Rice was first successfully raised in North America about 1680 when Henry H. Woodward planted seed given him by the captain of a Madagascar ship. Much of the wealth of the state was derived from it until the middle of the nineteenth century.



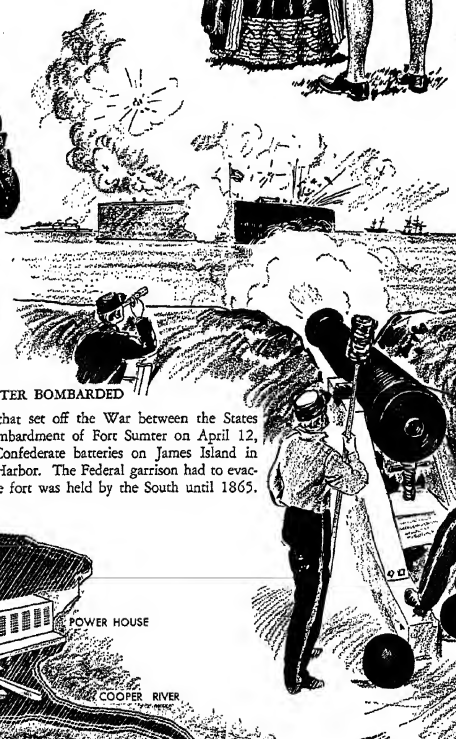
#### ELIZA LUCAS RAISES INDIGO

In 1742, Eliza Lucas (later Mrs. Charles Pinckney) succeeded in growing the indigo plant on her father's plantation near Wappoo Heights. Because the deep-blue dye produced from it was in great demand in Europe, it was a leading export throughout the entire colonial period.



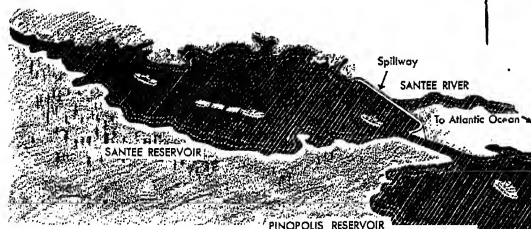
#### CHAMPION OF THE SOUTH

In 1832, when the Clay Tariff Act was passed by Congress, South Carolina passed the Ordinance of Nullification, declaring the act null and void in the state. Under the leadership of John C. Calhoun, South Carolina became the spokesman and champion of the South.



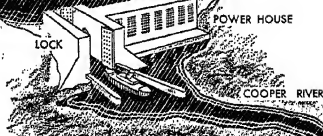
#### FORT SUMTER BOMBARDED

The spark that set off the War between the States was the bombardment of Fort Sumter on April 12, 1861, by Confederate batteries on James Island in Charleston Harbor. The Federal garrison had to evacuate and the fort was held by the South until 1865.



#### HARNESSING THE SANTEE AND COOPER RIVERS

On its completion in 1942, the eight-mile-long Santee Dam harnessing the Santee and Cooper rivers not only provided hydroelectric power for industrial needs, but also made available for navigation an abandoned canal, originally built about 1800.



pulp mills in the world is at Georgetown. The porcelain clay, or kaolin, produced in South Carolina is the purest to be found anywhere. It has been exported since the earliest times.

The state still has its pioneers in agriculture and industry. The Coker family of Hartsville is experimenting with improved cotton. The farmers of tidewater and sand hills are trying out different crops of vegetables, fruits, and quick-growing pine. The millowners and laborers of the uplands are working on new educational and social programs. On the Santee River system and other waterways of the state, engineers are developing vast water-power resources. They are helping the state to conserve its fertile soil and improve its transportation system.

### The Land and Its Resources

**Extent:** Area, 31,055 square miles (461 square miles are inland water); thirty-ninth in size among the states. *Greatest length*, 235 miles. *Coast line*, 200 miles.

**Physical Features:** *Chief mountain range*, Blue Ridge Mountains. *Chief peaks*, Sassafras Mountain (3,548 feet), Mount Pinnacle (3,218 feet), Caesar's Head (3,218 feet), Table Rock (3,157 feet). *Elevation*, highest, Sassafras Mountain, 3,548 feet above sea level, in Pickens County; lowest, sea level, along the Atlantic Coast. *Chief rivers*, Black, Edisto, Pee Dee (largest tributaries, Little Pee Dee, Lynches), Santee (largest tributaries, Broad, Catawba, Congaree, Saluda, Wateree), Savannah, Waccamaw. *Chief lakes*, Murray, Moultrie, and Marion. *Chief inlets and bays*, Bulls Bay, Charleston Harbor, Little River Inlet, Port Royal Sound, St. Helena Sound, Winyah Bay. *Chief islands*, Hilton Head, Isle of Palms, Parris, Port Royal, St. Helena.

**Climate:** *Temperature*, average annual, 63° F.; average summer, 78.8°; average winter, 46.7°; lowest on record, -13° near Longcreek in Oconee County (Jan., 1940); highest on record, 111° F. at Blackville and at Calhoun Falls (Sep., 1925). *Precipitation*, average annual, 47.69 inches; average Apr. 1 to Sep. 30, 26.99 inches; average Oct. 1 to Mar. 31, 20.70 inches. *Snowfall*, average annual, 2.4 inches.

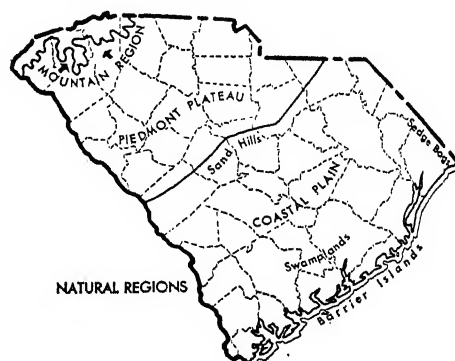
**Location, Size, and Surface Features.** South Carolina is one of the smaller states. It is shaped somewhat like a rough triangle. Beaufort, a seacoast city, lies in the same latitude as San Diego, Calif., on the Pacific. For the boundaries of South Carolina, see the colored map.

The state has three natural regions, the Coastal Plain, the Piedmont Plateau, and the Mountain Region.

The *Coastal Plain* of South Carolina is known to the natives as the "low country." The plain was at the bottom of the ocean in recent geologic ages, but movements of the earth's crust thrust the land above water. The old shore line can still be traced through Columbia and Camden. The present coast begins in the north as a smooth curving beach about sixty miles long. To the south, it is broken by many barrier islands, which are cut off from the mainland by sluggish creeks and salt marshes. Freshwater swamps lie along these islands, where their still, black waters reflect thick groves of palmettos, magnolias, live oaks, gum trees, and tall cypresses which are hung with Spanish moss. In these swamps, alligators bask in the sun. In the north, there are treeless sedge bogs or savannas, thick with reeds and flowers, and many insect-eating plants. This region extends below the Cape Fear River in North Carolina.

The rare and unusual Venus's-flytrap, an odd, insect-eating plant, grows wild only in the Carolinas.

The rivers of the tidal basin overflow their banks for fifteen to thirty miles inland. Floods are especially heavy in spring when tides are running high, and they cover the bottom lands with a rich silt or sediment. In the past, the rice fields stretched long distances along the rich bottom land. Today, the rice grows wild, and it attracts vast flocks of migrating birds. Many acres of land suitable for farming lie above the flooded lands and swamps, and along the inland banks of the Congaree and the Saluda rivers. This is the region of the large cotton and tobacco plantations. There are numerous truck farms. Many lumber mills are located above the swamplands. The pine barrens of the sand-hill country are northwest of these fertile lands. They extend across the state from northeast to southwest along the Fall Line. This area



is thinly covered with blackjack oaks and scrub pines. It was once considered the least productive region of the state. Today, it furnishes great numbers of scrub pine and oak for the paper and pulp mills. Grapes, peaches, asparagus, and strawberries are raised in the sandy soil, in places where the land has been cleared.

The *Piedmont Plateau* extends inland from the sand hills at the Fall Line. It begins as a level highland, but becomes more rolling and hilly until it reaches the foothills of the Blue Ridge Mountains. It is deeply cut by rivers and creeks, and its hills rise from eight hundred to a thousand feet above sea level. The plateau is dotted with small farms, ragged woods of cedar and pine, and many mill and factory towns. It is the richest and most thickly populated region of the state.

The *Mountain Region* covers only about five hundred square miles. The mountains are neither rugged nor steep, except for such high peaks as Table Rock and Caesar's Head. Few of the mountains are more than three thousand feet high and all are crowned with forests. Many summer homes and vacation resorts are scattered throughout the region. The Mountain Region and the Piedmont Plateau together are known as the "upcountry."

**Rivers and Lakes.** Three main river systems drain South Carolina. These are the Pee Dee, the Santee, and the Savannah. All three rise in the Blue Ridge Mountains across the border in North Carolina. They all empty into the Atlantic Ocean. The rivers develop tremendous hydroelectric power across the whole Pied-



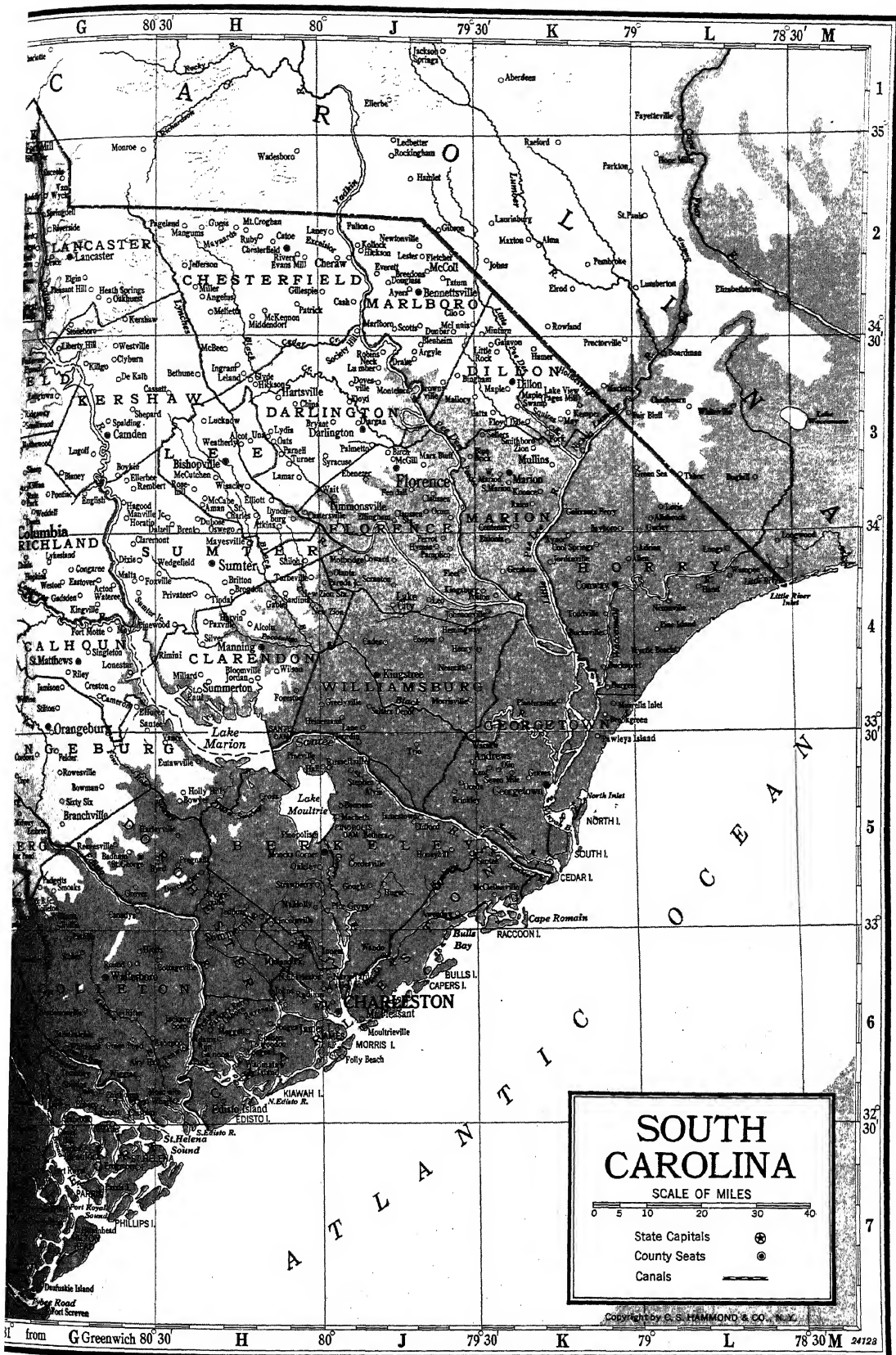
# SOUTH CAROLINA

Total Population 1,899,804

Abbeville, (D3)...	4,930	Boyd, (E3).....		Coosawhatchie, (F6) 53	Fairfax, (F6).....	1,379	Hartsville, (H3).....	5,399
Acton, (G4).....		Boykin, (G3).....	42	Cope, (G5).....	Fairforest, (D2).....	587	Harvin, (H4).....	
Ada, (E2).....		Bradley, (D3).....	200	Corderville, (J5)....	Fairmont, (B2).....	92	Heath Springs, (G2).....	570
Adamsburg, (E2)....	71	Branchville, (G5)...	1,351	Cordova, (G5).....	Fair Play, (B2).....	90	Heinenmann, (J4)....	
Adams Crossing, (C2).....		Brand, (E3).....		Cornwell, (F2).....	Fechtig, (G6).....		Helena, (E3).....	497
Adams Run, (H6)....	287	Breedons, (J2).....		Coronaca, (D3).....	Felder, (G5).....		Hellams, (D1).....	
Adger, (F3).....		Brent, (H3).....		Cosby, (F6).....	Fendall, (J3).....		Hemingway, (J4)....	536
Adrian, (L4).....	85	Brinkley, (J5).....		Cothran, (D3).....	Fenwick, (H6).....		Hendersonville, (G6)	
Aiken, (E4).....	6,168	Britton, (H4).....		Cottageville, (H6) ..	Filbert, (F1).....	84	Henry, (J4).....	
Airlee, (L4).....		Brogdon, (H4).....	89	Courtenay, (C2).....	Fingerville, (E1)....	327	Herbert, (F2).....	
Airy Hall, (G6).....		Brookgreen, (K4)....		Coward, (J4).....	Fleet, (J4).....		Hibernia, (E4).....	
Alcolu, (H4).....	797	Brown Hill, (E5)....		Cowpens, (E1).....	Fletcher, (J2).....		Hickory Grove, (F2)	272
Alcot, (H3).....		Brownsville, (J3)....	89	Crawford, (E2).....	Florence, (J3).....	16,054	Hickson, (H3).....	
Allen, (L4).....		Brunson, (F6).....	542	Crescent, (D2).....	Floyd, (J3).....		Hickson, (J2).....	
Allendale, (F5).....		Bryant, (J3).....		Creston, (G4).....	Floyd Dale, (K3)....	162	Hilda, (F5).....	246
Allsbrook, (L3)....	30	Bucksport, (K4)....	46	Crete, (C2).....	Folly Beach, (J6)....	200	Hilton, (F3).....	
Almeda, (F6).....		Bucksville, (K4)....		Crocketville, (F6)...	Foreston, (H4).....	210	Hiltonhead, (G7)...	985
Alston, (F3).....		Buffalo, (E2).....	1,704	Croft, (E4).....	Fork, (K3).....	122	Hiotts, (G6).....	
Alvin, (J5).....		Bullock Creek, (F2),		Cross, (H5).....	Forkshoals, (D2)....		Hobbsville, (E2)....	
Aman, (H3).....		Burgess, (K4).....		Cross Anchor, (E2)...	Fort Lawn, (G2)....	168	Hodges, (D3).....	303
Anderson, (C3)....	19,424	Burton, (G7).....	121	Cross Hill, (E3)....	Fort Mill, (G2)....	2,919	Holly Hill, (H5)....	1,062
Andrews, (K5).....	2,008	Byrd, (H5).....		Crosswell, (C2)....	Fort Motte, (G4)....	200	Honea Path, (D3)...	2,765
Angelus, (H2).....	100	Cades, (J4).....	222	Crow Creek, (C2)....	Foundation Inn, (D2)	1,346	Honey Hill, (J5)....	
Antreville, (C3)....	106	Caesars Head, (C1)...		Dacusville, (C2)....	Foxville, (H4).....		Hope, (F3).....	
Appleton, (F5).....	198	Calhoun, (C2).....	761	Dale, (G6).....	Frogmore, (G7)....	106	Hopkins, (G4).....	85
Arcadia, (E2).....	1,601	Calhoun Falls, (C3)	1,832	Dalzell, (H3).....	Frost, (F3).....		Horatio, (G3)....	62
Argyle, (J3).....		Callison, (D3).....	167	Dargan, (J3).....	Fudges, (G2).....		Huger, (J5).....	20
Arkwright, (D2)....	645	Camden, (G3).....	5,747	Darlington, (CJ3) ..	Fulton, (J2).....		Hughes, (F5).....	
Arlington, (D2)....		Cameron, (G4)....	624	Darrough, (D3)....	Furman, (F6).....	380	Hyman, (J4).....	79
Ashepool, (H6)....	60	Campobello, (D1)...	389	Daufuskie Island, (G7).....	Gable, (H4).....	309	Ingram, (H3).....	
Ashleigh, (F5).....		Canadys, (G5).....	199	Dawkins, (F3).....	Gadsden, (G4).....	100	Inman, (D1).....	1,115
Ashley Jr., (J6)....		Carem, (E2).....		Dean, (C3).....	Gaffney, (E1).....	7,636	Inness, (J6).....	
Ashton, (G5).....	171	Carlisle, (F2).....	303	Deerfield, (F7).....	Galavon, (K3).....		Irby, (D3).....	
Atkins, (H3).....	60	Cartersville, (J3)...	303	DeKalb, (G3).....	Galivants Ferry, (K3).....	150	Irmo, (D3).....	230
Attaway, (E3).....		Cash, (J2).....		Delta, (E2).....	Gannon, (H6).....		Islandton, (G6)....	157
Avon, (F2).....		Cassatt, (H3).....	88	Denmark, (F5)....	Garnett, (F6).....	190	Iva, (C3).....	1,285
Awendaw, (E3)....	20	Catawba, (F2)....	80	Dents, (C2).....	Gary, (E3).....		Jackson, (E5)....	173
Ayers, (J2).....		Catechee, (C2)....	588	Denver, (G3).....	Gaston, (F4).....	342	Jacksonboro, (H6)	67
Aynor, (K4).....	537	Catoo, (H2).....		Dillon, (K3).....	Georgetown, (K5)....	5,559	Jalapa, (E3).....	
Badham, (G5).....		Cayce, (F4).....	1,476	Dixiana, (K3).....	Gifford, (F6).....	150	James I., (J6).....	
Baldock, (F5).....	75	Centenary, (K3)....	60	Dixie, (F4).....	Gilbert, (F4).....	153	Jamestown, (J5)...	82
Ballentine, (F3)....	80	Central, (C2).....	1,496	Dochoeno, (D3)....	Gillespie, (H2)....		Jamison, (G4)....	132
Bamberg, (F5)....	3,000	Chapin, (F3).....	311	Donalds, (D3)....	Gillispie, (F6)....		Jason, (B2).....	
Barksdale, (D2)....		Chappells, (E3)....	195	Dorchester, (H5)...	Gillsonville, (F6)...		Jedburg, (H5)....	135
Barnes, (C3).....		Charleston, (J6)...	71,275	Doubling, (D2)....	Glendale, (E2)....	1,005	Jefferson, (H2)....	547
Barnwell, (F5)....	1,922	Cheddar, (C2)....		Douglass, (J2)....	Glenn Springs, (E2)	134	Jenkinsville, (F3)	113
Barnwell Sta., (F5)		Cheraw, (J2).....	4,497	Dovesville, (J3)....	Gluck, (C3).....	785	Jocassee, (B2)....	48
Barr, (F4).....		Cherokee, (E1)....		Drake, (J3).....	Godsey, (E3).....		Johns I., (H6)....	1,135
Barton, (F6).....		Chesnee, (E1).....	827	Drayton, (E1).....	Golden Grove, (D2)		Johnsonville, (J4)	464
Bascomville, (G2)...		Chester, (F2).....	6,392	Dubose, (H3).....	Goldville, (E3)....	1,665	Johnston, (E4)....	1,100
Bashan, (G6).....		Chesterfield, (H2)	1,263	Due West, (D3)....	Goshen, (H6).....		Jonesville, (E2)...	1,182
Batesburg, (F4)....	2,933	Childs, (G4).....		Dunbar, (J2).....	Gough, (J5).....		Jordan, (H4).....	275
Bath, (E5).....	829	China, (H3).....		Dunbarton, (E5)...	Gourdian, (J5)....		Jordanville, (K4)	39
Battlecreek, (B2)...	40	Chisholms, (G6)....		Duncan, (D2).....	Govan, (F5).....	113	Kathwood, (E5)....	165
Bayboro, (K3).....		Chisolm, (C6).....		Dyson, (E3).....	Grace, (G2).....		Kelton, (E2).....	47
Beaufort, (G7)....	3,185	Claremont, (G4)....		Early Branch, (G6)	Gramling, (D1)....	20	Kemper, (K3)....	69
Beech Island, (E5)...		Clarks Hill, (D4)...	162	Easley, (C2).....	Graniteville, (E4)	2,576	Kent, (K5).....	
Bell, (E4).....		Claussen, (J3)....	109	Eastatoe, (C2)....	Graves, (K5).....		Kershaw, (G2)...	1,264
Bellinger, (G7)....		Clayton, (F3).....		Eastover, (G4)....	Gray Court, (D2)	401	Kibler, (E3).....	
Belton, (C7).....	2,119	Clear Pond, (G5)....		Eau Claire, (F3)...	Grays Hill, (G7)....		Kilgore, (E2)....	
Bennettsville, (J2)	4,895	Clearwater, (E4)....	804	Edgefield, (E4)....	Great Falls, (G2)	3,700	Killgo, (G3).....	
Berlin, (F4).....		Clemson, (C2).....	857	Edgemoor, (F2)....	Greelyville, (J4)...	633	Killian, (G3).....	
Bethera, (J5).....		Cleora, (D4).....		Edisto Island, (H6)	Green Pond, (G6)...	300	Kinards, (E3)....	234
Bethune, (H3).....	620	Cleveland, (D1)...	200	Edmund, (F4).....	Green Sea, (L3)....	65	Kingsburg, (J4)...	200
Beverly, (C2).....		Clifford, (J5).....		Ehrhard, (F5).....	Greenville, (D2)...	34,734	Kings Cr., (F1)...	121
Bingham, (K3).....	101	Clifton, (E2).....	2,742	Elko, (F5).....	Greenwood, (D3)...	13,020	Kingstree, (J4)...	3,182
Birch, (J3).....		Clinton, (E3).....	5,704	Ellenton, (E5)....	Greer, (D2).....	2,940	Kirksey, (G3)....	89
Bishopville, (H3)...	2,995	Clio, (J2).....	821	Ellerbe, (G3).....	Gresham, (K4)....	57	Kline, (F5).....	282
Blacksburg, (F1)...	1,917	Clover, (F1).....	3,067	Elliott, (H3).....	Grover, (G5).....	85	Knox, (F2).....	
Blackstock, (F2)....	175	Clyburn, (G3).....		Elliore, (G4)....	Guess, (H2).....		Kollock, (J2)....	
Blackville, (F5)....	1,456	Clyde, (H3).....		Ellsore, (F4).....	Curley, (L3).....	171	Koonce, (K3)....	
Blairs, (F3).....	43	Cokesbury, (D3)....		Elmore, (E3).....	Guthrieville, (F2)	92	Ladson, (H6)....	62
Blaney, (G3).....	146	Cold Point, (D3)...		Elsie, (F4).....	Hagood, (G3).....	200	La France, (C2)...	964
Blenheim, (J3)....	237	Cold Springs, (D4)...		Embree, (G5).....	Hall, (H5).....		Lake City, (J4)...	2,522
Bloomville, (H4)...		Colleton, (G5).....		English, (G3)....	Hamburg, (E5)....		Laketon, (E4)....	
Blue Brick, (K3)....	185	Colliers, (D4).....	105	Enoree, (E2).....	Hamer, (K3).....	289	Lake View, (K3)...	532
Bluffton, (G7)....	459	COLUMBIA, (G3)...	62,396	Estill, (F6).....	Hampton, (F6)....	997	Lamar, (H3).....	921
Blythewood, (G3)...	231	Conestee, (D2)....	660	Eulonia, (K4).....	Hampton & Branchville Jr., (G5)...		Lancaster, (G2)...	4,430
Bonham, (E2).....		Congaree, (G4)....	140	Eureka, (E4).....	Hand, (L4).....		Lancett, (G6)....	
Bonneau, (J5).....	493	Converse, (E2)....	916	Eutawville, (H5)...	Hankinson, (E5)...		Lando, (F2).....	816
Bookman, (F3)....		Conway, (K4).....	5,066	Evans, (F2).....	Harbin, (B2).....		Landrums, (D1)...	1,289
Bordeaux, (D4)....	229	Cool Springs, (K4)...		Evans Mill, (H2)...	Hardee, (F7).....	1,361	Landsford, (G2)...	
Bowling Green, (F1)	43	Cooper, (J4).....	200	Excelsior, (J2)....	Harleyville, (H5)...	381	Lane, (J4).....	297
Bowman, (G5).....	799	Coosaw, (G6).....					Laney, (J2).....	
Bowyer, (H5).....								

● County seat.





# SOUTH CAROLINA

Total Population 1,899,804

Lanford Sta., (D2)...	120	Millard, (H4).....		Paris, (D2).....	542	St. Matthews, (G).....		Thor, (F4).....	
Langley, (E4).....	3,019	Milledgeville, (E4)...		Parkers Ferry, (H6)...		St. Paul, (H4).....	2,187	Tillman, (F7).....	162
Latham, (C2).....		Miller, (H2).....		Parksville, (D4).....	168	St. Stephen, (J5).....	339	Timmons, (J3).....	
Latimer, (C3).....		Millettville, (E5).....	171	Parnell, (H3).....		Salem, (C2).....	1,185	Tindal, (H4).....	
Latta, (K3).....	1,334	Mills, (C2).....		Paroda Jc., (J4).....		Salkehatchie, (G6)...	500	Tirzah, (F1).....	
Laurens, (D2).....	6,894	Minturn, (K2).....	96	Parr, (F3).....	41	Salter's Depot, (J4)...		Toddville, (C).....	
Leeds, (F2).....	160	Modoc, (D4).....	125	Parris I., (G7).....	237	Saluda, (D3).....	443	Tomotley, (G6)...	
Lees, (F5).....	171	Monck's Corner, (H5)...	1,165	Patrick, (H2).....	270	Samaria, (F4).....	190	Toney Cr., (D2)...	
Leesville, (F4).....	1,217	Monetta, (E4).....	242	Pattillo, (G6).....	20	Sandy River, (F2)...	1,516	Toogood, (J).....	
Leland, (H3).....		Montague, (D2).....		Pauline, (E2).....	135	Sandy Springs, (C2)...	87	Townville, (J).....	307
Lemon Spur, (F5)...		Montclare, (J3).....	92	Pawleys Island, (K5)...	194	Sevier, (F4).....		Toxaway, (C3).....	1,013
Leo, (J4).....	170	Montgomery, (F3)...		Peak, (F3).....	147	Sevensville, (F5)...	62	Travelers Rest, (D2)...	311
Leslie, (F2).....		Monticello, (F3)...	100	Pelham, (D2).....		Santee, (G4).....	186	Trio, (J5).....	
Lester, (J2).....		Montmorenci, (E4)...	152	Pelion, (F4).....	212	Santee, (K5).....		Troy, (D4).....	224
Level Land, (D3)...	40	Moore, (E2).....		Pelzer, (C2).....	3,012	Santuck, (E2).....	85	Tucapau, (D2).....	1,502
Levys, (F7).....		Morgana, (D4).....		Pendleton, (C2)...	1,278	Sardinia, (H4).....	113	Turbeville, (H4)...	234
Lewis Turnout, (F2)...	29	Morrisville, (J4)...		Perrot, (J4).....		Scotia, (F6).....	238	Turner, (F5).....	
Lexington, (F4).....	1,033	Moselle, (G5).....		Perry, (F4).....	141	Scotts, (J2).....		Ulmer, (F5).....	
Liberty, (C2).....	2,240	Mosquito Wharf, (H6)...		Pickens, (C2).....	1,637	Scranton, (J4).....	438	Una, (H3).....	
Liberty Hill, (G3)...	171	Motbridge, (J4).....	560	Piedmont, (D2)...	2,367	Seabrook, (G6).....	69	Union, (E2).....	
Lincolnton, (H5)...	261	Mouttrieville, (J6)...	6	Pine Grove, (J5)...		Sedalia, (E2).....	200	Vance, (H5).....	
Little Mountain, (E3)...	251	Mountain Rest, (B2)...	114	Pineland, (F6).....	89	Seiglingville, (F5)...	143	Van Wyck, (G2)...	89
Little River, (L4)...	300	Mount Carmel, (D3)...	209	Pineville, (H5).....	116	Seivern, (F4).....		Varnville, (F6)...	917
Little Rock, (K3)...	203	Mount Croghan, (H2)...	47	Pinewood, (H4)...	456	Sellers, (K3).....	681	Verdery, (D3)...	507
Livingston, (F4)...	178	Mt. Holly, (H5)...		Pinopolis, (H5)...	37	Seneca, (C2).....	2,155		
Lobeco, (G6).....	61	Mount Pleasant, (J6)...	1,698	Plantersville, (K4)...	84	Seven Mile, (K5)...			
Lockhart, (F2).....	2,244	Moutville, (E3)...	139	Pleasant Hill, (G2)...		Sharon, (F2).....	388		
Lockhart Jc., (E2)...		Moy, (G4).....		Pleasant Lane, (D4)...	167	Sharp, (C3).....		Walhall, (F5).....	2,820
Lodge, (G5).....	242	Mullins, (K3).....	4,392	Plum Branch, (D4)...	142	Sheldon, (G6).....	116	Walker, (F5).....	
Longest, (G4).....	106	Murphy, (C2).....		Pomaria, (F3).....	263	Shelton, (F3).....	167	Wallaceville, (F3)...	
Longcreek, (B2)...	7	Murrells Inlet, (K4)...	20	Ponpon, (H6).....		Shepard, (G3).....		Walterboro, (G6)...	3,373
Longs, (L4).....	69	Myrtle Beach, (L4)...	1,597	Pontiac, (G3).....		Sheriff, (C2).....		Wampee, (L4).....	163
Longtown, (G3)...		Navy Yard, (J6)...	1,225	Port Royal, (G7)...	342	Shoals Jc., (D3)...	17	Wando, (J6).....	264
Loris, (L3).....	1,238	Neeses, (F4).....	364	Poston, (K4).....	29	Sigsbee, (D1).....		Ward, (E4).....	204
Lowndesville, (C3)...	201	Nesmith, (J4).....	32	Pregnall, (H5)...		Silver, (H4).....	180	Ware Shoals, (D3)...	3,101
Lowrys, (F2).....	315	Newberry, (E3).....	7,510	Pride, (F2).....		Silverstreet, (E3)...	146	Warsaw, (K5).....	106
Lucknow, (H3).....	129	Newmarket, (D3)...	117	Prince, (D3).....	167	Simpson, (F3).....		Wateree, (G4).....	106
Lugoff, (G3).....	121	Newport, (F2).....		Pritchard, (F7)...		Simpsonville, (D2)...	1,298	Waterloo, (D3)...	150
Lumber, (J3).....		Newry, (C2).....	864	Pritchardville, (G7)...	86	Singleton, (G4)...		Watts, (D3).....	
Luray, (F6).....	162	Newtonville, (J2)...	107	Privateer, (H4)...		Six Mile, (C2).....	152	Watts Mills, (E2)...	1,579
Lydia, (H3).....	285	New Zion, (J4).....	292	Prosperity, (E3)...	719	Sixty Six, (G5)...		Weatherly, (H3)...	
Lykesland, (G4)...	93	Nichols, (K3).....		Puck, (H6).....		Slater, (C1).....	726	Weddell, (G3)...	
Lykesford, (F3)...		Nimmons, (C1)...	1,453	Radium, (H6).....	185	Smallwood, (G3)...		Wedgfield, (H4)...	200
Lyman, (D2).....	1,989	Nine Times, (C2)...	211	Ravenel, (H6).....	196	Smithboro, (K3)...	200	Wellford, (D2)...	454
Lynchburg, (H3)...	382	Ninety Six, (D3)...	177	Red Point, (F2)...		Smiths Turn Out, (F2)...	150	West, (J6).....	
Lyndhurst, (F5)...		Nixonville, (L4)...	177	Red River, (C2)...	324	Smoaks, (G5).....	168	W. Anderson, (C2)...	
McBee, (H3).....	587	Norris, (C2).....	733	Reesville, (G5)...	217	Smyrna, (F1).....	133	West Columbia, (F4)...	1,744
Macbeth, (J5).....		North, (F4).....		Reidville, (D2)...	214	Snelling, (F5)...	128	West Greenville, (D2)...	2,233
McCabe, (H3).....		North Augusta, (E4)...	2,629	Rembert, (G3)...	217	Society Hill, (J3)...	687	W. Marion, (K3)...	
McClellanville, (K5)...	431	North Charleston, (H6)...	2,522	Renno, (E2).....	41	S. Marion, (K3)...		Westminster, (B2)...	2,014
McColl, (J2).....	2,391	Norway, (F5).....	488	Reynold, (F5)...	183	Spalding, (G3)...		Weston, (G4).....	
McConnellsville, (F2)...	263	Oakhurst, (G2)...		Richburg, (F2)...		Spartanburg, (D1)...	32,249	West Union, (B2)...	449
McCormick, (D4)...	1,456	Oakvale, (D2)...		Richland, (B2)...		Spearman, (E3)...		Westville, (G3)...	85
McCutchen, (H3)...		Oakway, (B2).....		Ridgeland, (G7)...	1,021	Spigener, (E4)...		Whaley, (F5).....	
Macedon, (F4).....		Oats, (H3).....		Ridge Spring, (E4)...	661	Springdell, (G2)...		Whitehall, (G6)...	272
McGill, (J3).....		Oceda, (J5).....	54	Ridgeville, (H5)...	593	Springfield, (F4)...	786	White Oak, (F3)...	67
McInnis, (J2).....		Okatie, (G7).....	515	Ridgeway, (G3)...	408	Starr, (C3).....	349	White Pond, (F5)...	231
McKennon, (H2)...		Olanta, (J4).....	528	Riley, (G4).....		State Park, (G3)...		White Rock, (F3)...	141
Maddens, (D3).....		Oldport (Ebenezer), (F2)...	409	Rimini, (H4).....	107	Steedman, (F4)...		Whitmire, (E3)...	3,272
Madison, (B2).....	284	Oldtown, (E3).....		Rion, (F3).....	327	Stilton, (G4).....		Wiggins, (G6)...	61
Mallory, (J3).....		Olin, (K5).....	556	Ritter, (G6).....	38	Stokes, (G6).....	85	Wilkins, (G7)...	3,210
Malta, (G4).....		Ora, (E2).....	10,521	River Falls, (D1)...		Stoneboro, (G2)...		Wilksville, (E2)...	
Mangums, (H2)...		Orangeburg, (G4)...	2,402	Rivers, (H2).....		Strawberry, (H5)...	39	Williams, (G5)...	218
Manning, (H4)...	2,381	Orr, (C3).....		Riverside, (G2)...	20	Strother, (F3)...	116	Williamston, (C2)...	2,509
Manville Jc., (G3)...		Osborn, (H6).....	200	Riverview, (D1)...		Styx, (F4).....		Willington, (D4)...	304
Maple, (K3).....		Osceola, (G2)...	117	Robbins, (E5)...		Summertown, (H4)...	958	Williston, (F5)...	1,107
Maple Swamp, (K3)...		Oswego, (H3)...	187	Robins Neck, (J3)...		Summersville, (H5)...	3,023	Wilson, (H4).....	200
Marietta, (D1)...	267	Owings, (D2).....	352	Rock Hill, (F2)...	15,009	Summit, (F4).....	73	Windsor, (E5)...	151
Marion, (K3).....	5,746	Pacolet, (E2).....	2,160	Rockton, (F3)...		Sumter, (H4).....	15,874	Winnsboro, (F3)...	3,181
Marlboro, (J2)...		Pagoclet Mills, (E2)...		Rocky Bottom, (C1)...		Sumter Jc., (G4)...		Wisacky, (H3)...	91
Mars Bluff, (J3)...	209	Padgetts, (G5)...	989	Roddy, (G2).....		Sunnybrook, (E4)...		Wolfon, (G4).....	200
Martin, (F5).....	163	Pageland, (H2)...		Rodman, (F2)...	85	Sunset, (C2).....	20	Woodford, (F4)...	211
Mauldin, (D2)...	209	Palmetto, (J3)...		Ropp, (E3).....		Swansea, (F4)...	950	Woodruff, (E2)...	3,508
May, (K3).....		Pamplico, (J4)...	555	Rosehill, (H3)...		Switzer, (D2)...	85	Woodville, (D2)...	
Mayesville, (H4)...	520			Round O, (G6)...	145	Switzerland, (G7)...	5	Woodward, (F2)...	207
Maynards, (H2)...				Rowell, (G2).....		Sycamore, (F5)...	324	Wylie, (F2).....	
Mayo, (E1).....	85			Rowesville, (G5)...	402	Syracuse, (J3)...		Yemassee, (C6)...	684
McGegg, (H6).....	1,000			Ruby, (F3).....	337	Tamasee, (B2)...	171	Yenome, (F5)...	
Melletta, (H2)...				Ruffin, (G5)...	151	Tarboro, (F6)...		Yonges, (H6)...	
Meriwether, (D4)...				Russellville, (J5)...	171	Tatum, (J2).....	181	Yonges I., (H6)...	287
Meyers Mill, (E5)...	185			St. Charles, (H3)...		Thickety, (E1)...			
Middendorf, (H2)...				St. George, (G5)...	1,908				
Midland Park, (H6)...	503								
Midway, (G5).....									
Miley, (F6).....	63								

● County seat.

## SOUTH CAROLINA

mont Plateau, and especially at the Fall Line. The tides rise for fifteen to thirty miles upstream. The larger rivers can be sailed from the ocean to the Fall Line and many of them carry water traffic for over a hundred miles. There are no natural lakes in the state, but power dams which have formed artificial lakes have been built on several rivers. The largest artificial lakes are Lake Murray and Lake Greenwood, and the Moultrie and Marion reservoirs.

**Climate.** South Carolina has a subtropical climate along its coast, and it is almost tropical in the southernmost part. Mosquitoes breed in the swamplands, which are generally unhealthful places. The beach and island resorts enjoy cool night breezes in summer, and the upland and mountain regions have mild weather throughout the year. In the mountains, the temperature sometimes drops below zero and snow stays for several days. In other parts of the state there is little freezing weather and almost no snow. The rainfall, which is heaviest in summer, is evenly distributed. The winds in summer are from the south and southwest. In the winter, the western section has winds from the west and southwest. In the eastern section, the winds blow from the north. Severe hurricanes, which begin in the West Indies, sweep the South Carolina coast. The western region has occasional destructive tornadoes. Charleston was almost destroyed by an earthquake in 1886.

**Natural Resources.** Water power is South Carolina's greatest natural wealth. Since 1900 the development of hydroelectric plants has been rapid. The power has contributed to great industrial growth. Fertile soils help make it possible to harvest three crops a year of many berries and vegetables, and two crops of grain. There are large reserves of timber in the swamplands and wooded mountains, and also in wood lots scattered throughout the state. Valuable mineral deposits include pottery clays, phosphates, building stone, and small veins of gold and tin.

Wildlife is plentiful in the dense thickets and forests along the coast and in the uplands. Virginia deer are more plentiful in South Carolina than in any other state. Bear, opossum, raccoon, and red and gray foxes are also numerous. The state is the home of the handsome and rare black-skinned fox squirrel. The heron and egret still live in the cypress swamps. Flocks of wild ducks, wild geese, woodcocks, snipe, and wild turkeys are among the game birds. About 160 varieties of salt-water fish are found off the coast.

**Conservation and Development.** Five areas which cover about 200,000 acres have been set aside for state and Federal conservation projects. The largest projects are on the South Tiger River in Spartanburg and Greenville counties, and on Fishing Creek in Chester and York counties. In the areas, farmers are taught tree-planting, strip-cropping, and crop-rotation methods.

The South Carolina Commission of Forestry, which was created in 1927, protects and replants the woodlands. There are several Federal fish hatcheries at Orangeburg and Walhalla, and eight state hatcheries. The National Association of Audubon Societies, the Charleston Museum, and the Federal Government are among the agencies maintaining bird refuges and sanctuaries.

## SOUTH CAROLINA

### The People and Their Work

**Population:** 1,899,804 (1940), ranking twenty-sixth among the states. **Density,** 62.1 persons per square mile, ranking eighteenth. **Distribution,** urban, 24.5 per cent; rural, 75.5 per cent. **Largest cities,** Charleston (71,275), Columbia (62,396), Greenville (34,734), Spartanburg (32,249). For population of other cities, see back of colored map. **Chief Ports,** Charlestown, Georgetown.

**Chief Products:** *Agricultural,* cotton, tobacco, dairy products, corn, hogs, fruit, vegetables, pigeons and poultry, eggs, oats, wheat, peanuts, rice, potatoes, shrubs, and flowering plants. *Mineral,* granite, kaolin, phosphates. *Lumber,* cedar, cypress, gum, oak, pine, poplar. *Fisheries,* shrimp, oyster, crab. *Manufactured,* cotton and rayon textiles and yarns, dyed goods, furniture and lumber products, wood pulp, paper, nonalcoholic beverages, fertilizers, newspapers, chemicals, canned foods, ships.

**The People.** Since the Revolutionary War, there has been little change in the population pattern of South Carolina. Most of the inhabitants are born in the state, and many of them are descendants of the early English settlers. Along the southern coasts, traces of French and Spanish influence can be found which date back from the earliest attempts to colonize the area. A few scattered signs are all that remain of the Indian days. There is a tiny reservation for Catawba Indians in York County.

The first successful colonists were Englishmen from the mother country and from Barbados. They settled around the present location of Charleston. The new settlers established the plantation system, which relied on large numbers of slaves. The colonists piled up great wealth through the exports of indigo and rice. Many Dissenters from England and Huguenots from France settled in South Carolina because of its broad-minded religious and political policies.

The lands between the tidewater and the Fall Line were settled by German Swiss, Germans from the Rhine Valley, Scotch-Irish, and by persons from neighboring colonies. Between 1745 and 1760, immigrants from the Rhine, from the colonies to the north, and from Ulster settled the upcountry. Large numbers of Scotch-Irish came to the colony at the close of the Indian Wars in 1761. The Scotch-Irish became industrious small farmers, and a few of them owned slaves. By 1776 there were 60,000 white persons in South Carolina. Nearly half of them lived in the upcountry. There were more than 80,000 Negroes living on the plantations of the low country, which amounted to nearly three colored persons to one white. The black people continued to outnumber the whites in the state except for a short time early in the 1800's. In 1930 there was an increasing number of whites. One of the most interesting groups of Negroes is the Gullah, who live around Beaufort. Their strangely soft accent has affected the speech of both white and black persons in the tidewater region.

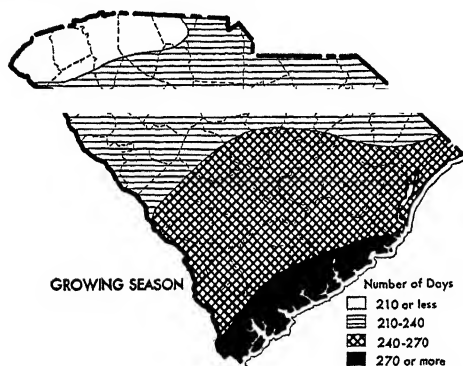
After the Revolutionary War, the only large groups of newcomers to South Carolina were the Irish, who left Ireland because of the potato famine of 1845-1847, and the North Germans, who came after the political struggle of 1848 in Germany. Today, the foreign-born persons make up 0.3 per cent of the population, one of the lowest among the states. Greeks and Germans lead in foreign-born groups. The whites make up 57.1 per



cent of the population, and the Negroes make up 42.9 per cent.

**Agriculture.** Agriculture has been the leading occupation since the first English settlers brought casks filled with roots, slips, and seeds ready for planting in the fertile soil of the new colony. The first rice to be grown successfully on the North American continent was planted in the South Carolina swamps in 1680 by Henry Woodward. This Madagascar rice is an especially large and fine variety which grew very well in the tidewater country along the coast. The state produced from half to two thirds of the rice grown in the United States until 1860.

Indigo, which is used in making beautiful blue and purple dyes, was introduced to South Carolina in 1742 by Elizabeth Lucas. Millions of pounds of indigo were shipped to the dye plants of Europe. Rice and indigo were the chief sources of wealth in colonial days. During the Revolutionary War, South Carolina lost its indigo markets because of greater indigo production in the West Indies. The invention of chemical dyes which easily replaced indigo as a dye added to the final ruin



of the indigo industry in South Carolina. After the War between the States, it was found that rice could be grown more cheaply in other states. Today, in South Carolina, rice is raised only for use within the state.

**Cotton.** Some cotton was raised in colonial times, but it did not become an important export until the sea-island variety was introduced shortly after the Revolutionary War. The invention of the cotton gin in 1792 encouraged the growing of cotton in the interior of the state, and South Carolina became one of the leading cotton producers. After the War between the States, there was so much cotton produced that lower prices resulted. Plantation owners could not pay wages to the great numbers of farm hands needed for growing and picking the crop. As a result, many large plantations were broken up.

Today, the increased production of cotton in other regions and the low price in the world market have turned the planter to raising many different crops. Cotton is still the leading crop and South Carolina ranks seventh among the states in cotton production. It is grown in almost every county. The Coker family of Hartsville have produced a cotton plant that does not wilt easily and resists disease. This plant is now grown on a large scale throughout the southern United States.

**Tobacco,** especially the bright-leaf variety, flourishes in the Pee Dee Valley. It ranks second only to cotton in cash value. About 1886, in Florence County, Frank M. Rogers experimented with stripping and curing tobacco leaves as they ripened, until the entire plant was harvested. Superior tobacco was produced by this method which is used today throughout the bright-leaf tobacco regions. Around Estill, there is another important tobacco-producing region where record-breaking crops have produced over 1,000 pounds to an acre. Mullins is the tobacco-marketing center of the state. Other large tobacco markets are located at Florence and Timmonsville.

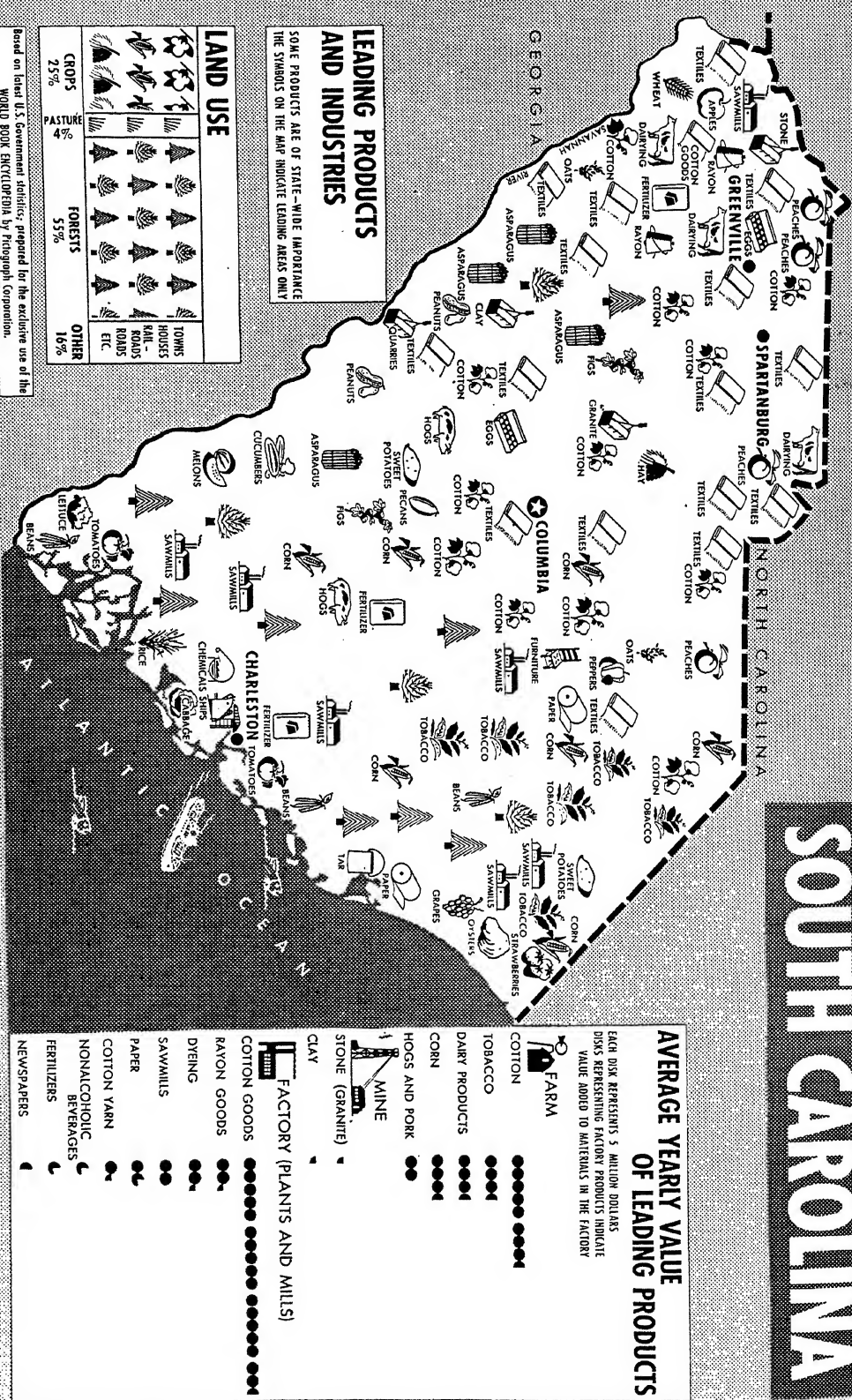
**Fruits, Vegetables, and Other Small Crops.** South Carolina ranks first among the states in the production of early cabbage, which is shipped from Meggett in Charleston County. Peppers are shipped from Florence, and only Louisiana produces more peppers than South Carolina. The growing of asparagus is centered in the sand-hill region. South Carolina ranks high among the states in the production of asparagus. The state is also a leader in the growing of tomatoes and Irish and sweet potatoes. Peas, snap beans, lettuce, watermelons, and cantaloupes are important crops. In Bamberg, melons are covered with wax. The wax protects the melons, and they are exported to Europe. The largest strawberry market in the state is at Loris, in Horry County. Pecans, which are grown in many sections, are an especially important crop in Calhoun and Orangeburg counties. Peaches are shipped from Greenville, York, Spartanburg, Chester, and Laurens counties. The production of peanuts, which is centered in the Savannah River area, has increased 300 per cent since 1930, because so many new industrial uses have been discovered for peanuts. Pansy seed is grown at Fountain Inn in Greenville County, and paprika is raised in Florence and Dillon counties. Florence County also ships large numbers of shrubs and flowering plants.

**Corn** has been raised since early colonial days, and today it is produced in all sections of the state. Corn which is ground into meal, is one of the chief foods of the people. Soybeans and hay are other important crops. Sorghum cane is grown on the upper Piedmont and in the mountains.

**Livestock.** When the cotton crop became damaged by the boll weevil, many of the farmers turned to poultry farming and the building up of herds of purebred cattle and hogs. The region between Sumter and Columbia leads the state in production of cattle and hogs. Many hogs are raised in the mountains to be used by persons living in that region. There are many excellent dairy herds along the northern boundary, around Chester and at Pendleton and Rock Hill. One of the most successful specialized industries is the pigeon farm at Sumter. It is the largest pigeon farm in the world, and each year it ships about 100,000 squabs to all parts of the country. Turkeys are grown in several sections of the state. Race horses, which are trained near Columbia, are world-famous. Seabiscuit, one of the greatest race horses of all time, was raised here.

**Manufactures.** Since most of the persons living in South Carolina were farmers, and because of a lack of transportation in the Piedmont area, the state was slow

# SOUTH CAROLINA



Based on latest U.S. Government statistics, prepared for the exclusive use of the  
WORLD BOOK ENCYCLOPEDIA by Thompson Corporation.

to develop its manufactures. But the Piedmont region is an area naturally adapted to manufacturing, because of the vast supply of water power in its swift rivers. During colonial times and in the early 1800's, a few mills for manufacturing grist, lumber, and textiles were established in this region. The mills were usually run by slave labor. The first successful cotton mill was begun by William Gregg in Aiken County in about 1840. It is still in operation. Only seventeen cotton mills were running at the beginning of the War between the States, and most of them were closed during the Reconstruction days. In 1876 a cotton mill with 10,000 spindles was built at Piedmont, and soon after the war, modern industry began.

About 1895, electric power began to take the place of direct water power. A mill at Columbia was probably the first textile mill in the world which was run entirely by electric power. Today, South Carolina has more than 5,000,000 spindles and 125,000 looms. The state competes with North Carolina for leadership in the manufacture of cotton goods. Many rayon mills operate in the state. South Carolina's textile industry produces more wealth than all its farms. Among the leading textile manufacturing communities are Spartanburg, Columbia, Greenwood, Greenville, Rock Hill, Aiken, Anderson, and Belton.

The cottonseed-crushing industry is second in importance only to cotton textile production. This industry is centered at Anderson, Camden, Marion, Columbia, Ninety Six, and Greenwood. The process of getting oil from cottonseeds was first developed in North America at Columbia in 1826.

Every section of the state has lumber mills. Cheap pine lumber, and crates and boxes which are used for packing truck crops are made in the coastal swamps. The mills produce lumber, wood veneers, and furniture. Sumter, Aiken, Camden, and Charleston are great lumber-shipping points. There are large paper mills which use huge amounts of wood pulp taken from the slash-pine and scrub-oak forests. Turpentine, pitch, and tar are produced from the longleaf pines which grow around Ellenton on the Savannah River, and at Patrick near Cheraw.

The largest cigar factories in the state are at Charleston. Bricks and tile are made near Marion, Greenville, and Sumter. Glass is manufactured at Laurens. Canning is a growing industry in South Carolina. Beaufort is noted for its shrimp, oyster, and fish canneries. Many vegetable and fruit canneries have been set up to process the crops grown in Marlboro County, and in Charleston, Beaufort, and other counties bordering the Atlantic Coast. Spartanburg is one of the principal canning centers of the state.

There are large gristmills, and feed and flour mills at Greenville. Trucks and steel bodies for buses are made at Rock Hill. Plows are built at Florence, and chemicals are manufactured at Greenville.

Many hydroelectric projects on the rivers of the Piedmont Plateau and along the Fall Line generate power to run the mills and factories. South Carolina ranks fourth among the states in hydroelectric power which could be developed. The state is a leader in the use of electric power. The Dreher Shoals Dam, which was

built in 1930 to harness the power of the Saluda River, is one of the largest earthen dams of its kind in the world.

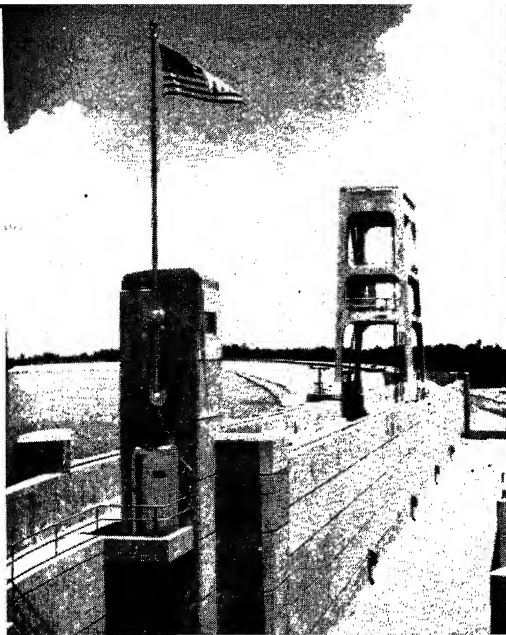
**Fisheries.** The many bays and salt-water creeks of the coast contain vast oyster beds. Oysters are the most important sea-food product of the state. Those oysters gathered at Bulls Bay are especially famous. The most important fishing center is Murrells Inlet, where shrimp, oysters, crabs, clams, mussels, flounder, shad, and salt mullet are canned or prepared for shipment. Other fishery centers are Beaufort, Port Royal, and Charleston. Terrapin, which is a kind of turtle, is an important sea-food product of the fish-packing plants along the coast. Pike, perch, and trout are caught in fresh-water streams on the upper Piedmont.

**Minerals.** In colonial times, clay or "porcelain earth" was shipped to England from pits located near Camden. This clay was used by Josiah Wedgwood, the famous potter, who praised its quality. The purest porcelain clay in the world, called kaolin, is found between Aiken and the Savannah River. South Carolina ranks second only to North Carolina in the production of kaolin. The clays of South Carolina are used as fillers in the making of cotton goods and fine book papers.

The famous blue granite which is widely used for monuments is quarried near Winnsboro. Eighteen other counties have granite quarries. There are several stone and glass-sand pits near Columbia, in Richland County. There is a large sand refinery at Kingstree. Tin is mined in small amounts at Smyrna. This tin mine is one of the few in the United States. Gold is also found at Smyrna. The Haile gold mine near Lancaster is one of the largest mines in the eastern United States. It has been worked from time to time since 1828. A new method of mining which was introduced in 1934 greatly increased gold production. Phosphate rock, which was once the chief mineral wealth of the state, is losing its importance. The rock is still crushed, refined, and shipped in commercial amounts from Beaufort. It is used in fertilizer factories at Charleston, Columbia, and Greenville.

**Transportation.** The first means of transportation in South Carolina were canoes and Indian trails. As the colony grew, the paths became rude wagon tracks, but for many years much of the traveling was done by water. Rivers are still used to haul freight. Many canals were built between the time of the Revolutionary War and the laying of the first railroads. In recent years the canals have been widened and deepened, especially those in the Santee-Cooper basin which connect Charleston with Columbia. Today, the Atlantic Intracoastal Waterway, which extends from Boston to Florida, runs between the barrier islands and the mainland of South Carolina. It protects small ships from storms. Good harbors are found at Charleston and Port Royal. Port Royal has the deepest natural harbor south of Chesapeake Bay, although it has never become commercially important.

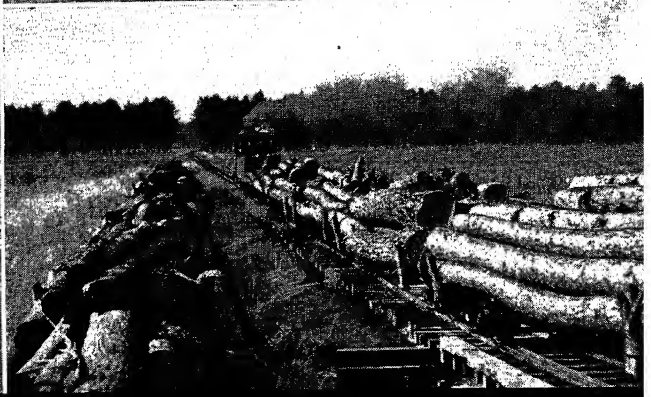
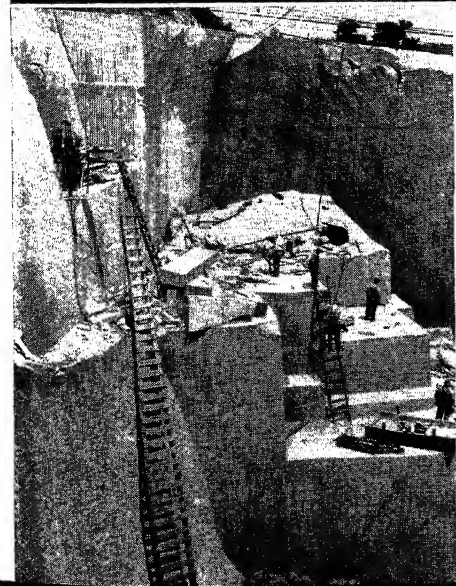
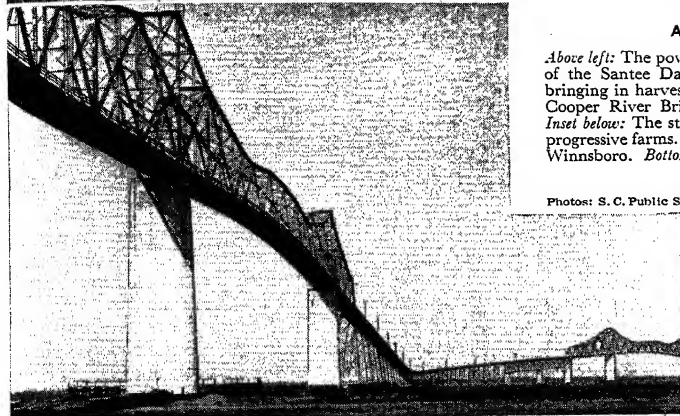
In 1827 the first railroad was chartered to run between Charleston and Hamburg. Today, South Carolina has more than 3,600 miles of railroads. Columbia and Spartanburg are important railroad centers, and Florence has huge shops for repairing rail equipment. Florence is also the point where shipments of fruit, vegetables, and



#### A NEW INDUSTRIAL FRONTIER

*Above left:* The powerhouse at the east end of the Pinopolis Reservoir of the Santee Dam, near Charleston. *Above right:* Sharecroppers bringing in harvested tobacco from fields near Manning. *Left:* The Cooper River Bridge connecting Charleston with the mainland. *Inset below:* The state Capitol at Columbia. *Below:* One of the more progressive farms. *Bottom left:* The famous blue-granite quarries near Winnsboro. *Bottom right:* Lumbering is an important industry.

Photos: S. C. Public Service Auth.; F. S. A.; Julien; Gendreau





fish are packed again in ice and sent on to northern markets.

The State Highway Department was set up in 1917. Since then all parts of the state have been joined by more than 6,500 miles of hard roads. Important engineering projects have been completed in building roads across swamps and sand beds.

South Carolina has more than thirty airports, and large naval fields and seaplane bases at the Charleston Navy Yard and a Marine Corps Airfield on Parris Island near Beaufort. The army maintains several important flying fields in the state.

**Press and Radio.** The first newspaper in the colony was the *South Carolina Weekly Journal*. It was founded in Charleston in 1730, but existed for only six months. The *South Carolina Gazette* was begun at Charleston in 1731 and was published continuously until 1792. It was followed by the *Courier*, which was first published in 1803. This paper became the *News and Courier*, and today it is Charleston's chief morning newspaper. Before the War between the States, the Charleston *Mercury* led in the campaign for states' rights. It engaged in fiery discussions on the abolition of slavery. The *Mercury* and the *Courier*, with the *Southern Review*, the *Southern Quarterly Review*, and *Russell's Magazine*, greatly influenced the political and economic thinking of the South.

There are more than ninety newspapers and about thirty periodicals published in South Carolina. Besides the Charleston *News and Courier*, the largest newspapers include the *State* and the *Record* of Columbia, the *News* and the *Piedmont* of Greenville, and the *Spartanburg Herald-Journal*.

The first radio station was WFPA. It was founded at Spartanburg in 1929. Other important stations are WIS, and WCOS, Columbia; WFBC, Greenville; and WCSC and WTMA, at Charleston.

### Social and Cultural Achievements

**Educational Institutions:** *Colleges, Seminaries, and Universities*, Clemson Agricultural (state-supported), Coker, Columbia, Columbia Bible, Erskine, Lander, Lime-stone, Newberry, Presbyterian, Winthrop (for women, state-supported), and Wofford colleges; the College of Charleston; Medical College of the State of South Carolina (state-supported); The Citadel (military, state-supported); Lutheran Theological Southern Seminary; Furman University; and the University of South Carolina. *Negro Colleges and Universities*, Avery Institute, Benedict, Claflin, Clinton Normal and Industrial, and Morris colleges; State Colored Normal, Industrial, Agricultural and Mechanical College of South Carolina (state-supported); Allen University.

**State Welfare, Correctional, and Penal Institutions:** *Children* (correctional), the South Carolina School (boys), at Florence; the John G. Richards School (Negro boys), at Columbia; John de la Howe School (dependent boys and girls), at McCormick. *Physically handicapped*, Institution for the Deaf, Dumb, and Blind, at Cedar Springs. *Mentally handicapped*, State Training School at Clinton, for mental defectives; State Hospital (white and Negro), at Columbia, for the insane. *Penal institutions* (white and Negro), state penitentiaries for men and for women at Columbia.

**Education.** South Carolina soon became known as an educational leader among the colonies, for its schools were open to all. An act of 1710 appointed commis-

sioners to handle legacies for a free school. In 1712, the lawmaking bodies voted a yearly sum to the school for the benefit of poor pupils. The great increase in the Negro population and the settlement of remote communities in the upcountry created an educational problem that has lasted to the present day. The problem is to provide schools for both whites and Negroes not only in the cities but also among a scattered rural population.

In 1868 the present school system was set up, but separate schools for whites and Negroes were not established until 1878. High schools became a part of the public-school system in 1907. Public education is handled by the state board of education. It is assisted by county boards and local district officials. Poverty made it hard for many of the people to go to school. The number of persons who could not read or write grew, until South Carolina had the highest rate in the country. In 1918 the legislature created a division for adult instruction to fight the problem of illiteracy. Adult-education work, which was begun in 1913 among the mill-workers of Spartanburg, had already proved unusually successful. School attendance was made a requirement of law in 1922. Since then, illiteracy has dropped sharply. The Parker District School, which is near Greenville, is well known among educators throughout the nation for its experiments in job education for mill children. The State Normal, Industrial, Agricultural, and Mechanical College of South Carolina, at Orangeburg, was opened in 1896 as a school for Negro men and women.

The accredited colleges and universities of South Carolina are discussed under their own names in THE WORLD BOOK ENCYCLOPEDIA. A list of these colleges and universities will be found in the Related Subjects at the end of this article.

**Libraries.** South Carolina has been called "the mother of free public libraries of America." The first free library was established at Charleston in 1698. In 1700, at the same time as New York, the provincial assembly created a library commission. The first library to be supported by taxes was the Marion Public Library. In 1748, the "Charles Town Library Society," which still operates, began one of the most valuable newspaper files in the nation. In 1802, funds were granted to the College of South Carolina, which is known today as the University of South Carolina, to start a library. In 1840 the school built the first college library building in the United States.

In 1903 an act was adopted which allowed towns and cities to support free public libraries within their financial limits. A State Library Association was organized in 1915. It was created to support and develop the library services of the state. South Carolina has forty library systems. Some rural areas receive library service through bookmobiles and mail service.

**Arts and Crafts.** The most interesting art of colonial times in South Carolina was the decoration of houses by local artists, both Negro and white. Homes with delicately wrought iron grilles at windows, doors, and garden gates, and intricate interior wood carving and plaster scrollwork are found in Charleston and scattered along the tidewater rivers. The early architects changed the Georgian (English) architecture to fit the hot climate



of the region by building thick brick walls, high basements, deep porches, and shaded balconies on the breezier sides of the house. Robert Mills, who designed the Washington Monument in Washington, D.C., built many of the finest homes and public buildings in the state. Many tiny churches, called "chapels of ease," were built on the plantations. Formal gardens were laid out for wealthy planters by garden architects from England. These gardens are especially beautiful because of the black waters of swamp and creek, the moss-hung cypresses and live oaks, and the native flowers that adorn them.

Painting, especially portrait painting, passed through a brilliant period in Charleston during the years between the Revolution and the War between the States. During this period, art was generally supported by wealthy planters. Two painters of miniature landscape pictures of that period were Edward Greene Malbone and Charles Fraser. These artists rank with the best painters of miniatures in America. John Blake White painted many murals or wall paintings in the public buildings at Washington, D.C. Mark Catesby made the illustrations for a *Natural History of Carolina, Florida, and the Bahamas* in 1722. These drawings are in a class with John Audubon's famous pictures of birds which were painted a hundred years later in the woods around Charleston. The Catawba Indians, who live on a small reservation in York County, fashion a type of pottery which is known throughout the country for its charm. Interest in art is upheld by the Gibbes Art Gallery in Charleston, and by the privately supported Brookgreen Gardens, which contain many beautiful and famous examples of American sculpture.

Music and drama have been important in the culture of South Carolina, since the performance of one of the first operas in America at Charleston in 1734. The St. Cecilia Society of Charleston, which was formed in 1762, gave the first symphony orchestra and first open-air concerts to America. The chants and spirituals of the Gullah Negroes deeply inspired George Gershwin when he wrote *Porgy and Bess* in 1936. The Negro spirituals also influenced South Carolina's most famous composer, Lily Strickland, who wrote *Lindy Lou* and *Honey Chile*. The Gullah music is being preserved by the Society for the Preservation of Spirituals, at Charleston.

Early literature of the state was mostly political and historical writing. John C. Calhoun's great speeches, which championed the cause of states' rights, rank with the best of their day. Modern writers who have won national fame include Archibald Rutledge, poet, DuBose Heyward and Hervey Allen, novelist-poets, and Julia Peterkin, interpreter of Negro life.

**Religion.** The early English settlers were loyal to the faith of King Charles II, who had just regained his throne and re-established the Episcopal Church of England. But the charter of the colony was very generous in its statements on religious beliefs. The first governor, William Sayle, was a Nonconformist, which shows that there was great tolerance of religion in the colony. Before 1690 many Calvinists and Baptists came from England and New England, and Huguenots, or French Protestants, from France. A few wealthy Jews, who had paid the passage for boatloads of settlers from England,

joined the colonists. Before the Revolutionary War, Scotch-Irish Presbyterians, German Lutherans, Quakers, Baptists, and other Protestant groups settled in the up-country. Until the second state constitution was adopted in 1778, complete freedom of worship was not given. Members of all religious faiths were not allowed to hold office or vote until 1790.

Today the church membership according to population is larger in South Carolina than in any other state except Utah. The largest church groups are the Baptists, Methodists, Presbyterians, Lutherans, Roman Catholics, and Orthodox Jews. Since World War I, a number of Pentecostal denominations have increased rapidly in membership.

**Social Welfare.** The State Board of Health was established in 1879. It has done excellent work in educating the Negro, lowering the death rate among infants, and controlling such epidemics and plagues as malaria and typhoid fever, which commonly occur in the South. The board has also been active in controlling diseases contracted by workers in textile, glass, paper, pottery, tobacco, and food-manufacturing plants. It offers many health services to industrial workers. An industrial commission was created in 1935 to administer workmen's compensation laws. An unemployment-compensation commission was set up in 1936. In 1937 a law was passed which did not allow the employment of children under sixteen in mines and factories. In 1938 South Carolina law limited working hours to forty a week in the textile industry. This law was passed several months before a similar Federal law. In 1945 South Carolina set up retirement laws for teachers and state employees, and increased the waiting period for marriage licenses.

### Recreation and Outdoors

South Carolina is one of the most popular vacation states of the South. Thousands of persons come to its seashore and mountain resorts each year for both winter and summer recreation.

The most famous resorts are at Aiken and Camden in the sand-hill region. The chief sports here are polo, horseback riding, drag and fox hunts, golf, and tennis. Sportsmen come in the fall to shoot wild turkey, duck, quail, bear, and deer. Fishing in fresh and salt water is a year-round sport. From December to May, the blossoming gardens of the coast attract visitors from all parts of the United States. The gardens near Charleston are especially beautiful.

**State and National Parks and Forests.** Over a million acres have been set aside as state and national parks and forests. The national forests include Francis Marion (414,700 acres), on the coast, and Sumter (1,007,904 acres), which has three divisions: Enoree, near Chester, Long Cane, which lies along the Savannah River, and a section in the Blue Ridge Mountains.

Most of the state parks have facilities for picnicking and camping. Among the state parks are:

**Cheraw** (7,562 acres), near Cheraw. Beach along a 360-acre lake in sand-hills region. Camping, boating, and fishing. Created, 1934.

**Edisto Beach** (1,255 acres), on Edisto Island. Oak and palmetto forest and high dunes overlooking the bathing beach. Created, 1935.

**Kings Mountain** (6,166 acres), near Blacksburg, in the Piedmont Region. Scene of the battle that changed the course of the Revolution in the South. Bathing beach on lake, hardwood forest. Created, 1934.

**Myrtle Beach** (320 acres), near Myrtle Beach. Sand dunes overlooking the sea, and hiking trails through dense longleaf pine forest. Created, 1934.

**Sesqui-Centennial** (1,500 acres), near Columbia. Named for the 150th anniversary of the founding of the city of Columbia. Lake set in a pine forest. Created, 1934.

**Table Rock** (2,860 acres), near Greenville. Trails lead past beautiful waterfalls to the peaks of Table Rock and Pinnacle mountains. Indian legends say that here a huge chief dined 3,000 feet above ordinary mortals. Trout streams and large artificial lake. Created, 1935.

**Other Interesting Places to Visit.** South Carolina is known for its historical past as well as for its beautiful houses and gardens. Among the places that attract many visitors are:

**Battlegrounds.** *Camden*, where Gates was defeated by the British in 1780. *Cowpens*, near Gaffney, where Morgan and Pickens defeated the British in 1781. *Eutaw Springs*, near St. Matthews, where General Greene speeded up the British retreat to Charleston. *Hobkirk Hill*, at Camden, where Greene was defeated, but forced the British to vacate the town, April, 1781. See REVOLUTIONARY WAR IN AMERICA.

**Camps.** *Fort Jackson*, near Columbia, where large numbers of army personnel made it the third city of the state in World Wars I and II; *Camp Croft*, near Spartanburg, a large army training camp in World War II.

**Churches.** In Beaufort, *St. Helena Episcopal*, built 1724. In Charleston, *Huguenot* (French Protestant), founded 1680; *St. Philip's Episcopal*, parish organized 1680, present church built 1835-1838; *St. Michael's Episcopal*, noted for its graceful spire, erected 1752; *First Baptist*, designed by Robert Mills, erected in 1820. It stands on site of old church, whose members organized the first Baptist communion in the Carolinas in 1683; *Circular Congregational*, erected on site of White Meeting House, where Calvinist Dissenters worshiped in 1680; *St. Mary's Catholic*, built in 1838 for the mother parish of the Roman Catholic Church in the Carolinas, organized in 1794; *St. John's Lutheran*, built 1815, has beautiful wrought-iron gates. In Columbia, *First Baptist*, where the Confederate Ordinance of Secession was passed on December 17, 1860.

**Indian Mounds.** The largest, near Sumter, 50 feet high and 800 feet around, contained many interesting Indian relics and buried bones; another, near Camden, is 30 feet high and 160 feet around.

**Fort Hill**, near Anderson. Home of John C. Calhoun, champion of states' rights, and against high tariffs.

**Fort.** *Blockhouse*, on state line north of Spartanburg, trading post and frontier fort in Indian wars; *Charleston*, remnant of early settlement by Huguenots at Port Royal; *Fort Johnson*, in Charleston Harbor, seized from the British by Americans in 1765 in defiance of the Stamp Act; *Fort Moultrie*, in Charleston Harbor, where British battleships were defeated, June, 1776; *Fort Sumter*, in Charleston Harbor, where the first cannon shot fired in the War between the States, in 1861; *Wiel Point*, near Charleston, where Governor Sir John Johnson successfully fought off French and Spanish fleets in Queen Anne's War, 1702.

**Islands.** *Belle Isle* and *Brookgreen*, near Georgetown; *Middleton*, *Runnymede*, *Magnolia*, near Charleston; *Orangeburg*; *Kalmia*, near Hartsville; *Ke*, near Sumter.

## Government

**National:** Electoral votes, 8. Representatives Congress, 6.

**State:** Senators, 46; representatives, 124; *Capital*, Charleston, 1670-1790; Columbia since 1790.

**Counties:** 46.

South Carolina is governed under the constitution adopted in 1895. This is the state's sixth constitution since the beginning of the Revolution. Amendments may be proposed in either house of the legislature, and they become law after they are approved by two thirds of the members of each house and by the people. Constitutional conventions may be called by a two-thirds vote of approval in each house and a majority vote of the people. The state constitution has several unusual and important provisions against lynching. It also prohibits divorce for any cause, and any person who does not believe in God is refused the right to hold office.

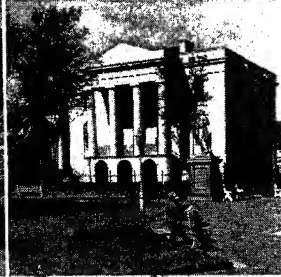
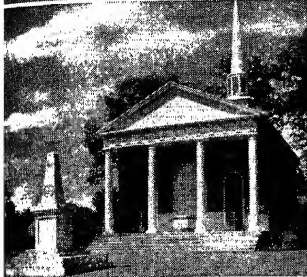
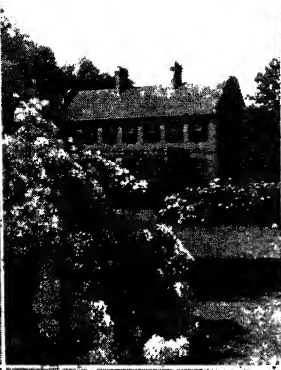
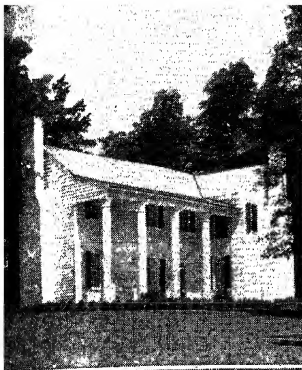
**Executive** officers include the governor, lieutenant governor, secretary of state, comptroller general, attorney general, treasurer, adjutant and inspector general, secretary of agriculture, and superintendent of education. These positions are held for four years. The governor may not serve two terms in succession.

**Legislative** power is vested in a general assembly which consists of a senate with half its members elected every two years, and a house of representatives, whose members are elected for two years.

**Judicial** power is vested in the supreme court, circuit courts, courts of common pleas, courts of general sessions, and justice courts. The chief justice of the supreme court and four associate judges are elected by oral vote in the general assembly for a term of ten years. Fourteen circuit judges are elected in the same way as supreme court judges, and they serve for four years. Justices of the peace are elected by the people.

**Local Government** is centered in the county or city. Counties are generally managed by commissions elected by the people. The county has no lawmaking body, and local laws are decided upon by the senators and representatives and presented to the general assembly. Since the legislature makes local as well as state laws, it has a great amount of responsibility and unusual powers. Towns or cities come under legislative authority of the general assembly, but they may use some of their own powers, such as freeing new industries from taxes. Sumter was the first city in the state to adopt the city-manager form of government, in June, 1912. In 1923 the legislature gave all cities of 20,000 to 50,000 population the opportunity to adopt this system.

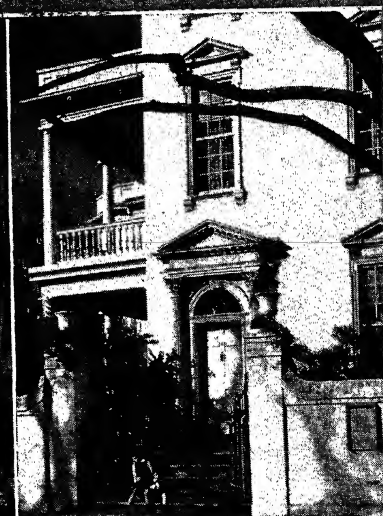
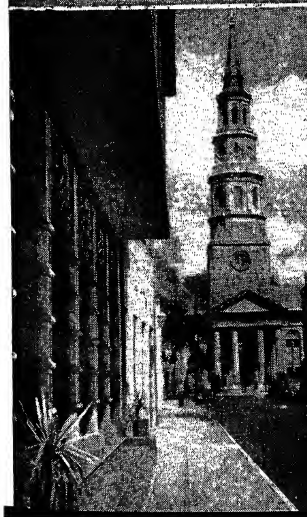
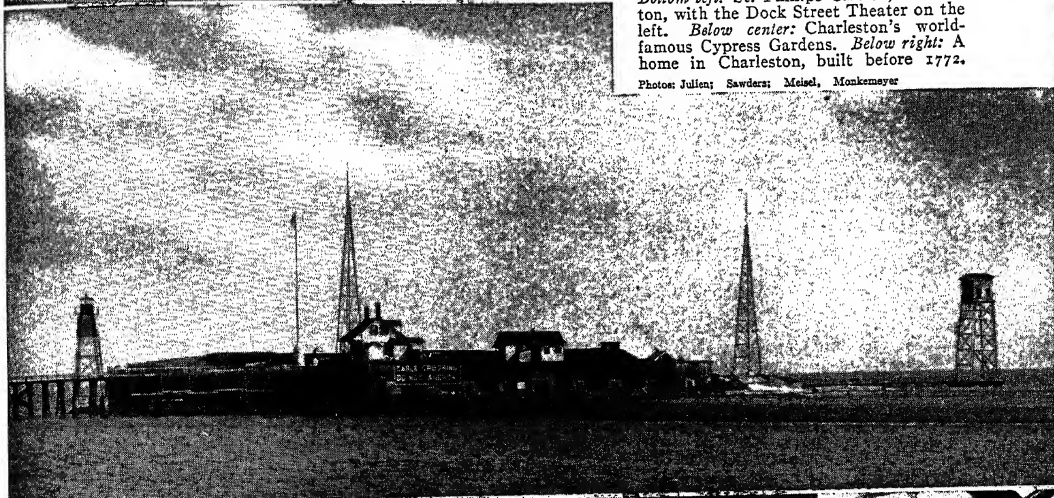
**National Politics.** During the troubled years before the War between the States, John C. Calhoun, George McDuffie, and Robert Y. Hayne defended states' rights. They favored doing away with the high tariffs that northern industrial states had set up, and finally they stood for secession. However, until just before secession, the northwestern counties were strongholds of Union sentiment, led by Benjamin F. Perry of Greenville, and by the great Charleston lawyer, James L. Petigru. When war broke out, South Carolina was the first state to draw up an Ordinance of Secession. Since 1876, the state has voted the Democratic ticket in national elections. See POLITICAL PARTY (chart).



#### FAMOUS BUILDINGS AND GARDENS

*Top left:* Fort Hill, home of John C. Calhoun, is now a part of Clemson College, near Anderson. *Top center:* Middleton Gardens, near Charleston, were landscaped in 1740. The house was once the home of Arthur Middleton, a signer of the Declaration of Independence. *Top right:* A typical planter's home of ante-bellum fame at Beaufort. *Second left:* The De Kalb monument in front of the Presbyterian Church at Camden. *Left:* The Hall of Records at Charleston, the first fireproof building in the United States. *Below:* Historic Fort Sumter in Charleston harbor. *Bottom left:* St. Phillips Church, Charleston, with the Dock Street Theater on the left. *Below center:* Charleston's world-famous Cypress Gardens. *Below right:* A home in Charleston, built before 1772.

Photos: Julien; Sawdars; Meisel; Monkemeyer



## Famous Men and Women

Many noted persons, native to South Carolina or doing their most important work there, are given separate biographies (see Biographies, in the list of *related subjects* at the end of this article). Others who have won state, national, or international fame include:

**Coker, David R.** (1870-1938), born in Hartsville. Known wherever cotton is grown for the long-staple disease-resistant cotton plant he developed. Several members of the Coker family have been agricultural experts and economists who have contributed to the prosperity of the South.

**Gadsden, Christopher** (1724-1805), born in Charleston. Revolutionary orator and soldier who led the fight for independence in South Carolina. His grandson, James Gadsden (1788-1858), born in Charleston, made the Gadsden Purchase in 1854 while serving as minister to Mexico.

**Gildersleeve, Basil Lanneau** (1831-1924), born in Charleston. One of America's leaders in the field of the study of the cultures of civilized peoples. He was one of the first professors at Johns Hopkins University. Wrote several classical studies.

**Grimké, John Faucheraud** (1752-1819), born in Charleston. Jurist, Revolutionary leader, special pleader in England for the cause of the colonies. His daughters, Sarah Moore (1792-1873) and Angelina Emily Grimké (1805-1879), were brilliant workers for the antislavery cause among Southern women; his son, Thomas Smith Grimké (1786-1834), was against secession, and pioneered in the causes of temperance and world peace.

**Mills, Robert** (1781-1855), born in Charleston. Designer of the Washington Monument in Washington, D.C., and of many homes, churches, public buildings, and canals in South Carolina.

**Peterkin, Julia** (1880- ), born in Laurens County. Novelist and short-story writer, the author of *Scarlet Sister Mary*, which won the Pulitzer prize as the best novel in 1929. Her works portray the life of the Gullah Negroes of South Carolina.

**Petlgru, James Louis** (1789-1863), born in Abbeville District. Lawyer, political leader of great honesty who helped in the fight against high tariffs; remained loyal to the Union.

**Pickens, Andrew** (1739-1817), born near Paxtang, Pa. Indian fighter and Revolutionary soldier who was made a brigadier general for his brilliant leadership in the Battle of Cowpens.

**Rutledge, Archibald Hamilton** (1883- ), born in McClellanville. Author and poet. Awarded the John Burroughs medal for distinguished writing in the field of nature in 1930. Made Poet Laureate of South Carolina in 1931.

**Sumter, Thomas** (1734-1832), born near Charlottesville, Va. Continental officer guerrilla fighter, known as "The Gamecock." Leading small bands of fighters, he defeated the British Regulars in many remarkable battles in 1780-1781.

**Waddell, Moses** (1770-1840), born in Iredell County, North Carolina. Pioneer educator, founder of school at Willington which was attended by many famous leaders and educators of the South.

**Woodward, Henry** (1646-1686), probably born in the Barbados. Surgeon, first English settler in South Carolina. He surveyed Carolina for settlement in 1665, and planted the first rice fields in 1680.

## State Symbols and Events

**State Seal.** The palmetto growing out of a fallen oak stands for the victory of the Revolutionary defenders of a palmetto log fort against a fleet of British men-of-war, built of oak. The robed figure of a woman represents



Hope. Also on the seal are two Latin phrases: *Quis Separabit?* (Who shall separate us?) and *Animas Opibusque Parati* (Ready in Soul and Resource).

**State Flag.** A white crescent and a white palmetto tree on a blue field. See FLAG (color plate, Flags of the States).

**State Motto.** *Dum Spiro, Spero*

(While I breathe, I hope).

**State Bird.** Carolina wren. See BIRD (color plate, State Birds).

**State Flower.** Yellow jasmine.

**State Tree.** Palmetto.

**State Song.** "South Carolina," with words by Henry Timrod and music by Erroll Hay Colcock is unofficial, but popularly sung throughout the state.

**Annual State Events.** Among the interesting festivals and expositions that bring visitors to South Carolina during the year are:

*Polo Games*, Aiken and Camden, three times a week, January through March.

*St. Cecilia Ball*, Charleston, in January (no fixed date).

*Columbia Music Festival*, Columbia, first week in April.

*Azalea Festival*, Charleston, in April.

*Confederate Memorial Day*, state-wide, May 10.

*Tobacco Festival*, Mullins, first week in August.

*Cotton Festival*, Camden, in September (no fixed date).

*State Fair*, Columbia, third week of October.

*Palmetto State Fair* (Negro), fourth week of October.

*Junior Davis Cup Match* (tennis), Clinton, in the summer (no fixed date).

## History

1526 First Spanish settlement by De Ayllon.

1629 Grant of "Carolina" to Sir Robert Heath by King Charles I.

1663 New grant of same territory to eight lords proprietors by Charles II.

1670 First settlement by English near Charles Town.

1719 Authority of lords proprietors overthrown.

1729 South Carolina became a royal province.

1776 Independent government set up.

1780 Charleston captured by British; British forces defeated at Kings Mountain.

1789 First cotton mill established in Charleston.

1800 Santee-Cooper Canal completed.

1832 Ordinance of Nullification passed (repealed by compromise in 1833).

1860 Secession of South Carolina from the Union.

1861 Fort Sumter captured by Confederates.

1865 Columbia burned by General Sherman.

1876 Wade Hampton elected governor, and Reconstruction period ended.

1880 Electric power for textile industry begun.

1901-1902 South Carolina Interstate and West Indian Exposition held at Charleston.

1930 Drcher-Shoals power dam completed.

1941 Factories converted to war production, and many vital troop-training centers established.

1945 Farms and industries returned to peacetime production.

**Indian Days.** At least twenty-eight tribes of Indians, each with its own language and customs, once lived in South Carolina. The Cherokee and Yamasee were probably the most civilized. They lived in well-fortified villages of log huts, and had a council house where the tribe leaders met.

**Exploration and Settlement.** Spaniards from the island of Santo Domingo explored the coast in 1521. An

expedition of Spaniards led by De Allyn tried to make a settlement near Winyah Bay in 1526 and the French Huguenots tried to settle around Port Royal in 1562, but both colonies failed. Charles I of England granted the Carolina region to Sir Robert Heath in 1629. Until Charles II was restored to the throne in 1660, however, no serious attempts were made to found settlements. Charles II granted Carolina to eight lords proprietors, and in 1663 and 1664 a royal commission explored the region.

The first permanent settlement was made in 1670 on Albemarle Point. In 1680 the settlement was moved to Oyster Point on the Ashley and Cooper rivers, and named Charles Town. Charles Town was the southernmost stronghold of the English against the Spanish and French until the close of Queen Anne's War in 1713. The Yamasee Indians went on the warpath and seemed about to destroy the colony, but they were thoroughly beaten near Charles Town in 1715 and 1716.

The proprietors ruled the colony under an elaborate form of government set up by John Locke and called the "Fundamental Constitution." The colonists were dissatisfied with this form of government, and in 1719 they revolted against it. For two years the colony was governed by the colonists, but in 1720 a provisional governor was appointed. In 1729 the Carolina region was divided into two crown provinces, North Carolina and South Carolina.

**Revolutionary Days.** South Carolina was divided at the beginning of the colonists' struggle for independence. It had strong ties with England, since the colony had become wealthy through exports to England. The aristocrats who had made Charles Town the social and cultural center of the South, thought of England as their spiritual home. There was a strong desire for self-government, however, and there was a growing number of planter-merchants who supported the fight for independence because of the heavy taxes levied on them by the British. There were 137 battles fought in South Carolina during the Revolution. Many of these struggles were between the Tories and the Whigs, two political parties of the time.

In 1776 a patriot government was set up under a temporary constitution. Under this government, the British land and sea forces were defeated at Charles Town in June, 1776, and the name of the city was changed to Charleston. Four years later the British attacked again and captured Charleston after a two-months' siege. Many of the leading patriots were put in prison. However, Francis Marion and Andrew Pickens defeated the British regulars in one clash after another. Finally the great victories at Cowpens and Kings Mountain broke the grip of the British on the southern colonies. South Carolina had offered more money to the Revolution than any other colony except Massachusetts, and as much as the rest of the colonies put together.

**Early National Period.** The South Carolina delegates, especially Charles Pinckney, had a large share in developing the Constitution of the United States. They fought for the greatest protection of property interests and for states' rights, as both were important to the existence of the slave system. After the Constitution was adopted by the convention at Philadelphia, the South

Carolinian delegates faced the problem of getting the people of the state to accept it. Strong groups in both the upcountry and the low country bitterly objected to the Constitution because it granted broad power to the Federal Government. Only the skillful leadership of Charles Pinckney and other Federalist leaders led South Carolina voters to approve the Constitution on May 23, 1788. The state was the eighth to do so.

In 1790 the capital was moved to Columbia. The change had been voted in 1786, after the upcountry demanded a more central location than the old capital site, Charleston. In 1808 the political struggles between the low country, or rich planter group, and the Scotch-Irish settlers of the upcountry were settled by evening up the number of representatives in the legislature. The state was against large Federal power, and it demanded states' rights and free trade. In 1832 the Clay Tariff Act was adopted by Congress. But South Carolina adopted the Ordinance of Nullification, which declared the Clay Act to be null and void in the state. Secession was avoided only by compromise.

**War between the States.** With the adoption of the Ordinance of Secession in December, 1860, South Carolina was the first state to secede from the Union. The first shot of the war was fired at Fort Sumter in Charleston Harbor on April 12, 1861. In the great war, the state lost one fourth of its 63,000 soldiers. Charleston was fired upon from the sea and the Capitol at Columbia was burned. In Sherman's march from Savannah, Ga., much of the plantation system was destroyed, and the system has never fully recovered.

**Reconstruction.** From 1868 to 1874 many of the whites who had fought in the war were not allowed to vote. Careless, uneducated Negroes and white carpetbaggers from the North took over the government. A few able and educated Negroes, however, left important contributions to the state, such as the school system which was set up in 1868 by Francis L. Cardoza. When Wade Hampton was elected governor in 1876, the government was again run by native whites.

**State Progress.** For fourteen years, the conservative low country controlled the state government, but the farmers of the upcountry kept demanding more power. In 1890 Benjamin R. Tillman led a successful revolt against the rule of the low country. He became governor and set up agricultural and vocational education, and strengthened the principle of democracy. Tillman also created the State Dispensary, which was an experiment in the sale of liquor by the state.

South Carolina became one of the leading states in the manufacture of cotton goods, because of rapid industrial growth which began about 1880. Since 1915, great hydroelectric development and improved transportation have encouraged the growth of all industries. South Carolina has become one of the fastest growing manufacturing regions of the nation.

In World Wars I and II, South Carolina provided men and military equipment and was also the site of huge training centers. These included Camp Sevier in World War I, Camp Croft in World War II, and Fort Jackson in both wars. There is a permanent Marine Base on Parris Island, and a United States Navy Yard at Charleston.



**Related Subjects.** The reader is also referred to:

## BIOGRAPHIES

Allston, Washington	Jackson, Andrew
Baruch, Bernard Mannes	Lewisohn, Ludwig
Bethune, Mary McLeod	Longstreet, James
Burr, Theodosia	Marion, Francis
Byrnes, James Francis	Moultrie, William
Calhoun, John Caldwell	Pinckney, Charles Cotesworth
Cohen, Octavus Roy	Pinckney, Elizabeth Lucas
Gadsden, James	Poinsett, Joel Roberts
Gregg, William	Rutledge, John
Hampton, Wade	Simms, William Gilmore
Hayne, Robert Young	Woodward, William E.
Heyward, DuBose	

## CHIEF PRODUCTS

Cotton	Oyster	Textile
Cypress	Pecan	Tobacco
Granite	Sweet Potato	Watermelon
Kaolin		

## CITIES

Beaufort	Florence	Spartanburg
Charleston	Georgetown	Sumter
Columbia	Greenville	

## COLLEGES AND UNIVERSITIES

Charleston, College of	Limestone College
Citadel, The	Newberry College
Clemson College	South Carolina State
Coker College	Colored Normal, Industrial, Agricultural and Mechanical College
Columbia College	South Carolina, University of
Converse College	Winthrop College
Erskine College	Wofford College
Furman University	

## HISTORY

Colonial Life in America	Nullification
Confederate States of America	Reconstruction
Fort Moultrie	Revolutionary War in America
Fort Sumter	War between the States

## PHYSICAL FEATURES

Atlantic Intracoastal Waterway	Piedmont Region
Blue Ridge Mountains	Savannah River

## UNCLASSIFIED

Charleston Navy Yard	United States of America
Food (Famous Foods of the States)	(color plate, Landscaped Gardens [Middleton Gardens])
Santee-Cooper Project	Venus's Flytrap

## Books for Younger Readers

- GOVAN, CHRISTINE N. *Carolina Caravan*. Houghton, 1942. A summer on an island in South Carolina.
- GRAY, ELIZABETH J. *Betty Marlowe of Charles Town*. Viking, 1936. A girl accompanies her brother Rolf from London to their Carolina plantation in 1715.
- KJELGAARD, JAMES ARTHUR. *Rebel Siege*. Holiday, 1943. Wilderness fighting during the Revolution.
- LATTIMORE, ELEANOR FRANCIS. *Storm on the Island*. Harcourt, 1942. Life on an island off South Carolina and experiences during a hurricane.
- MEANS, FLORENCE C. *Shuttered Windows*. Houghton, 1938. Negro girl on a visit to her great-grandmother decides to stay and help educate her people.
- Palmetto Pioneers*. Bryan, 1938. (Writers' Program.) Six stories of early South Carolinians.

## Books for Older Readers

- HENNIG, HELEN KOHN. *Great South Carolinians*. University of North Carolina Press, 1940. Biographies of men from colonial times.

MILLING, CHAPMAN JAMES. *Red Carolinians*. Univ. of North Carolina Press, 1941. Complete history of the Indian tribes that lived in the Carolinas.

*Our South Carolina, Today from Yesterday*. PC Press, 1942. (Writer's Program.) History of the state.

RHETT, ROBERT GOODWYN. *Charleston; an Epic of Carolina*. Garrett, 1941. History of the city from its founding to the present.

ROBERTSON, BEN. *Red Hills and Cotton*. Knopf, 1942. Story of author's own family.

RUTLEDGE, ARCHIBALD H. *Home by the River*. Bobbs, 1941. Story of the author's ancestral home.

*South Carolina: a Guide to the Palmetto State*. Oxford, 1941. (American Guide series.) Excellently illustrated, descriptive guide.

WOLFE, JOHN HAROLD. *Jeffersonian Democracy in South Carolina*. Univ. of North Carolina Press, 1941. Political scene during the early nineteenth century.

An Outline suitable for South Carolina will be found with the article "State."

## Questions

What rare flower which traps insects grows in South Carolina?

What famous South Carolina architect designed the Washington Monument in Washington, D.C.?

Who introduced rice into South Carolina? When?

What great South Carolina statesman was the first champion of states' rights? On what college campus may his home be seen?

For what was each of the following famous: James Gadsden, Kings Mountain, Fort Sumter, Parris Island, Middleton?

In what part of the state is the tidewater country? Why is it so called?

When was cotton first grown in South Carolina? What variety was especially grown? Why was this variety in great demand by English millowners?

Who was the great English philosopher who helped to write the early form of government for the colony?

**SOUTH CAROLINA, UNIVERSITY OF**, is a state-controlled coeducational school at Columbia, S.C. Its divisions include the college of arts and sciences, the graduate school; the schools of commerce, law, engineering, journalism, pharmacy, education and social work; and an extension division.

The school was chartered as South Carolina College in 1801. It is one of the oldest state-supported schools in the United States. Its library building contains the largest and most valuable collection of South Carolina historical material in existence. Courses offered lead to the degrees of bachelor of arts, bachelor of science, master of arts, and master of science. Average enrollment is about 2,200.

F.H.W.

**SOUTH CAROLINA STATE COLORED NORMAL, INDUSTRIAL, AGRICULTURAL AND MECHANICAL COLLEGE** is the only state-supported institution of higher education for Negroes in South Carolina. It is in Orangeburg, and is coeducational. Its special services include an extension service, a vocational trade and industries program, vocational agriculture and home economics, unit trade courses, and experimental farming. Courses lead to bachelor's degrees in the arts and sciences. The college has an average enrollment of about 800.

J.D.McG.

**SOUTH CENTRAL STATES.** See UNITED STATES OF AMERICA (Location and Size).

**SOUTH CHINA SEA.** See CHINA SEA.



## SOUTH DAKOTA THE SUNSHINE STATE

**SOUTH DAKOTA**, *dah KO tah*, is named for the Dakota Indians. This Sioux tribe conquered other tribes to hold the land before the white men settled there. South Dakota is often called **THE SUNSHINE STATE**, because of its sunny climate, and is sometimes referred to as **THE COYOTE STATE**. It lies where the prairies of America rise to the Great Plains. South Dakota is a state "full of distance." It has no thickly populated cities, but miles of rich farm land and windswept grasslands which stretch to distant horizons.

The modern South Dakotan is famous for his steadfast courage in fighting dust storms, floods, and other misfortunes, to make the earth yield a rich harvest. His faith in the land has kept him at his task through both poor and prosperous years. His political and economic progress are shown in his efficient state government, and in the many co-operatives through which he and his neighbors market their crops. He has gained hope and knowledge from his pioneer parents who settled the land. These pioneers were the hardy prospectors who panned gold in the Black Hills. They were the Scandinavian and Yankee farmers who fought Indians, dust, and grasshoppers to make South Dakota one of the great farming states of the nation.

South Dakota is a leader among the prairie states in the variety of crops it grows. The wealthy farms east of the Missouri River produce huge amounts of many different farm products. South Dakota ranks third among the states in the growing of barley. Few states grow more flaxseed, sorghum, and oats than South Dakota. In the high plains of the west, the state is ranch country. Thousands of cattle and sheep graze on the grassy ranges.

The Black Hills of South Dakota have poured forth a glittering mountain of mineral wealth since Custer's men found gold there in 1874. The Homestake Mine at Lead is one of the largest gold mines in the world. Precious metal worth hundreds of millions of dollars has been taken from this mine. Black Hills gold is used for making beautiful jewelry. South Dakota ranks high in the mining of silver, which is a by-product of gold mining. The Black Hills contain some of the largest deposits of lithium in the world. Lithium is the lightest metal known.

Both vacationists and scientists visit the scenic wonderland of the Black Hills and the picturesque Bad

Lands, which is a region of weather-carved rock and clay. The rock formations of the Black Hills tell the story of the making of the earth's outer shell, almost as far back as the earliest-known geological age. The record of the rocks is studied by students of geology from many parts of the United States. The fossilized bones of prehistoric animals are taken from the White River Bad Lands and displayed in museums throughout the world.

The great beauty of the rock formations in their setting of rich, dark forest has made the Black Hills one of the most popular vacation spots in the country. The Mount Rushmore Memorial, sometimes called "The Shrine of Democracy," is located in the central part of the Black Hills. Here the heads of Washington, Jefferson, Lincoln, and Theodore Roosevelt are carved in granite on the mountainside. This memorial is the work of the sculptor, Gutzon Borglum. The sculptured heads are so large that Lincoln's nose is longer than the entire face of the Sphinx in Egypt.

### The Land and Its Resources

**Extent:** Area, 77,047 square miles (511 square miles of which are inland water), fifteenth in size among the states. *Greatest length* (north to south), 245 miles; *greatest width* (east to west), 380 miles.

**Physical Features:** *Mountains*, Black Hills. *Elevation*, highest, Harney Peak in Pennington County, 7,242 feet above sea level; lowest, Big Stone Lake in Roberts County, 962 feet above sea level. *Chief river*, Missouri (chief tributaries, Cheyenne, James, White, Big Sioux, Vermillion). *Chief lakes*, Andes, Big Stone, Enemy Swim, Kampeska, Lakes of the Pines, Sylvan, Traverse, Waubay.

**Climate:** *Temperature*, average annual, 45.3° F.; average summer, 70.1° F.; average winter, 19.1° F.; lowest on record, -58° F. at McIntosh (Feb., 1936); highest on record, 120° F. at Gannaville (July, 1936). *Precipitation*, average annual, 18.97 inches; average Apr. 1 to Sep. 30, 14.44 inches; average Oct. 1 to Mar. 31, 4.53 inches. *Snowfall*, average annual, 36.1 inches.

### Pronunciation Guide

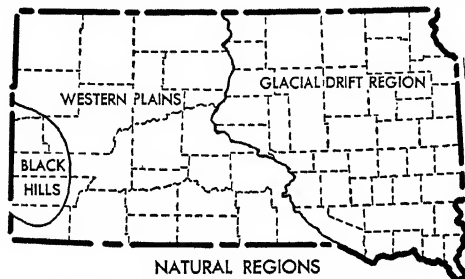
Belle Fourche	Haakon <i>HAW kahh</i>
BEL FOORSH	Jerauld <i>jeh RAWLD</i>
Bon Homme <i>bahn</i> HAHM	Lead <i>leed</i>
Deuel <i>DOO el</i>	Ziebach
Faulk <i>fawk</i>	

**Location, Size, and Surface Features.** South Dakota is shaped like a rough rectangle. It lies near the exact center of North America. A monument near Pierre, the capital, marks the center of the state. The area of South Dakota is larger than Indiana and Kentucky put together. For the boundaries of South Dakota, see the colored map.

South Dakota is divided into three natural regions: the Glacial Drift Region, the Western Plains, and the Black Hills.

The *Glacial Drift Region* takes in the area in South Dakota which was covered by great sheets of ice many ages ago (see ICE AGE). It is generally flat except for river valleys, moraines (heaps of earth and stone left by glaciers), and coteaux (a coteau is a high rolling area with lower land on either side, formed by a glacier). Heaps of boulders, which were left by the glaciers, are seen beside the fields, where they have been removed from the path of the farmer's plow.

The *Western Plains Region*, which lies west of the Missouri River, is part of the Great Plains Region of



the United States. The high, level land is broken by deep river valleys, and slopes gently toward the Missouri. Hills of earth and stone, called *buttes*, are landmarks of the plains. Some of the buttes are so high that they can be seen for miles. Most of these buttes are the remains of a great plain that once extended for hundreds of miles along the Rocky Mountain front. The greater part of the great plain has been worn or washed away.

The White River Bad Lands are in the Western Plains Region. These Bad Lands are made up of curiously carved ridges and mounds out of which rise grotesque towers and columns of rock. Most of this section has no plant life, but some of the hollows and mesas have enough grass for grazing. Here, some of the most important fossil deposits in the world are found. They contain the fossilized bones of small three-toed horses, humpless camels, saber-toothed tigers, and other prehistoric animals.

The *Black Hills*, which are actually mountains, rise in the southwestern part of the state. They are formed by the pushing up and folding of great rock layers, and by the action of old volcanoes. The mountains are broken and rugged. This region of towering rocks and lofty pines is one of the beauty spots of America. Since none of the peaks reaches above timber line, forests are found on top of the hills. The Black Hills furnish large amounts of lumber, and contain rich mineral deposits. Water power is available in the many swift mountain streams. There is some farming in the narrow mountain

valleys which lie in the Black Hills section of the state.

**Lakes, Rivers, and Artesian Wells.** Most of the lakes in South Dakota were formed during the Ice Age, when drainage water was dammed up behind the piled earth in the glaciers. These lakes are located mainly in the northeast. Lake Traverse, which is located in the extreme northeastern corner of the state, drains into Hudson Bay by way of the Red River. Big Stone Lake, only a few miles away, drains into the Mississippi, through the Minnesota River. Sylvan Lake and Lake of the Pines, in the Black Hills, are popular resorts.

The principal river of the state is the Missouri, which crosses the middle of the state and drains most of its area. In the east, several streams drain glacial lakes and flow southward to join the Missouri as it swings toward the southeast. The streams in western South Dakota, such as the Grand, Moreau, Cheyenne, and White rivers, flow in a general eastward direction and empty into the Missouri. Many of these streams have cut deep valleys through the high plains.

The water that lies beneath the valleys of the James and Missouri rivers comes to the surface in artesian wells. There are also many artesian wells east of the James River. Altogether, there are 12,000 to 15,000 artesian wells in the state.

**Climate.** South Dakota is famous for its cloudless skies. There are many days of severe cold in winter and extreme heat in summer, because the state is far from any large bodies of water. There is considerable difference in climate in different parts of the state, because the state is large in area, and because the surface features range from prairies to mountains. The Black Hills are the coolest part of the state in summer. The rainfall varies from more than 25 inches in the southeast to less than 15 inches in the northwest. In summer, the prevailing winds blow from the south and southeast in the eastern two thirds of the state, and from the west in the western portion. In winter, the winds are from the west and northwest.

**Natural Resources.** The great natural wealth in South Dakota is the soil. The glacial drift east of the Missouri River is fertile, and usually receives enough rainfall for plentiful crops. Most of the surface of Brown and Spink counties, in the northeast, is a flat plain of silt or loam. It is an excellent wheat-growing region. The land west of the Missouri River is fertile, but it usually gets too little rainfall for much crop-raising. It produces wild grass for range cattle and sheep.

In the northwestern counties, there are huge fields of lignite (see COAL [Other Kinds of Coal]), which is mined for use within the state. Gold, silver, and other minerals are mined on a large scale in the Black Hills. This region also provides ponderosa pines for lumber and hydroelectric power from the dashing streams.

There are many herds of deer in the Black Hills and along the Missouri River. There are some deer in the northeast, and antelope are plentiful west of the Missouri. Badgers, muskrats, skunks, and other small animals live in all parts of the state. Game birds include many waterfowl, which follow the Missouri River on their north-south flights in autumn and spring. Partridges, prairie chickens, and pheasants also are found in South Dakota. The pheasant hunting in the state,

# SOUTH DAKOTA

Total Population 642,961

Aberdeen, (M3).....	17,015	Britton, (O2).....	1,500	Creston, (D6).....	19	Iresteel, (G3).....	160	Henry, (P4).....	322
Academy, (M7).....	3	Brookings, (R5).....	5,346	Crocker, (O3).....	102	Flandreau, (R5).....	2,212	Heppner, (B7).....	8
Adelade, (N3).....	142	Bruce, (R5).....	394	Crooks, (R6).....	97	Florence, (P3).....	254	Hereford, (D5).....	121
Agar, (J4).....	35	Bryant, (P4).....	658	Crow Lake, (M6).....	1,845	Foley, (P4).....	200	Hermosa, (C6).....	592
Ahnberg, (P5).....	151	Buffalo, (B2).....	518	Custer, (B6).....	23	Folsom, (D6).....	200	Herreid, (K2).....	246
Akaska, (J3).....	114	Buffalo Gap, (C6).....	275	Cuthbert, (N6).....	22	Forestburg, (N5).....	199	Herrick, (L7).....	11
Albee, (R3).....	581	Bullhead, (G2).....	10	Dahlberg, (P2).....	278	Forest City, (J4).....	168	Hetland, (P5).....	7
Alcester, (R7).....	746	Bullock, (B2).....	109	Dalesberg, (P8).....	118	Forestville, (P3).....	1,650	Hidden Timber, (J7).....	11
Alexandria, (O6).....	72	Burbank, (R8).....	49	Dallas, (K7).....	17	Fort Lookout, (L6).....	764	Hill, (F5).....	559
Allen, (F7).....	440	Burch, (O2).....	17	Dalzell, (E5).....	29	Ft. Meade, (C5).....	613	Hill City, (B6).....	335
Alpena, (N5).....	61	Burdett, (M4).....	602	Danforth, (M5).....	230	Ft. Pierre, (H5).....	335	Hill Crest, (C7).....	110
Alsen, (R8).....	144	Burdock, (B7).....	10	Dante, (N7).....	410	Ft. Thompson, (L5).....	422	Hillhead, (P2).....	17
Altamont, (R4).....	161	Burke, (L7).....	153	Dark Canyon, (C5).....	17	Fox Ridge, (E4).....	976	Hillside, (N7).....	160
Amherst, (O2).....	350	Burkmore, (L3).....	227	Date, (D3).....	461	Frankfort, (N4).....	15	Hillsview, (L2).....	15
Andover, (O3).....	15	Bushnell, (R5).....	665	Davis, (P7).....	115	Franklin, (P6).....	168	Hisega, (C5).....	17
Appleby, (R4).....	195	Butler, (O3).....	115	Deadwood, (B5).....	23	Frederick, (N2).....	7	Hitchcock, (M4).....	75
Ardmore, (B7).....	63	Cadillac, (H2).....	333	Deerfield, (B5).....	127	Freeman, (O7).....	180	Holabird, (K4).....	93
Artesian, (O6).....	502	Cady, (J7).....	2,518	Dell Rapids, (R6).....	37	Fruitdale, (B4).....	666	Holmquist, (O3).....	479
Ashton, (N4).....	214	Camp Crook, (B2).....	7	Delmont, (N7).....	542	Fullerville, (P8).....	566	Hooker, (R7).....	10
Astoria, (R4).....	16	Canistota, (P6).....	102	Dempster, (R4).....	121	Fulton, (O6).....	278	Hoover, (C3).....	369
Athboy, (F2).....	271	Canning, (K5).....	195	Denby, (E7).....	190	Gage, (M2).....	478	Hopewell, (H4).....	26
Athol, (M3).....	225	Canova, (O6).....	17	De Smet, (O5).....	460	Galena, (B5).....	417	Hosmer, (L2).....	4,083
Aurora, (R5).....	7	Canton, (R7).....	7	Dewey, (A6).....	15	Gallup, (N3).....	581	Houghton, (N2).....	162
Avance, (E4).....	728	Carlock, (L7).....	102	Dimock, (O7).....	16	Garden City, (O4).....	478	Hoven, (K3).....	32
Avon, (N8).....	170	Carpen, (O4).....	42	Dixon, (L7).....	374	Garreston, (S6).....	50	Hudson, (R7).....	26
Badger, (P5).....	126	Carter, (J7).....	512	Doland, (N4).....	374	Gary, (S4).....	180	Humboldt, (P6).....	417
Badnation, (J6).....	270	Cash, (D2).....	15	Dolton, (P7).....	121	Gayville, (P8).....	152	Huntimer, (R6).....	586
Baltic, (R6).....	126	Castle Rock, (B4).....	10	Dowling, (F5).....	171	Geddes, (M7).....	479	Hurley, (P7).....	10,843
Bancroft, (O5).....	75	Castlewood, (R4).....	493	Draper, (J6).....	1,002	Geddes, (M7).....	32	Huron, (N5).....	10,843
Barnard, (N2).....	106	Cavours, (N5).....	138	Dumont, (B5).....	10	Glad Valley, (F3).....	180	Ideal, (K6).....	32
Batesland, (E7).....	75	Cedarbutte, (G6).....	15	Dupree, (F3).....	460	Glencross, (H3).....	180	Imogene, (D3).....	7
Bath, (N3).....	17	Cedar Canyon, (D3).....	8	Duxbury, (M3).....	15	Glendo, (D2).....	17	Inland, (D3).....	182
Bear Butte, (C5).....	17	Center, (P6).....	53	Eagle, (L6).....	16	Glenham, (J2).....	85	Interior, (F6).....	25
Bearsley, (O7).....	19	Center Point, (P7).....	53	Eagle Butte, (G3).....	374	Glenview, (C2).....	115	Iona, (L6).....	25
Beebe, (L3).....	19	Centerville, (R7).....	1,046	Eakin, (K4).....	171	Glenview, (C2).....	152	Ipswich, (L3).....	1,002
Belle Fourche, (B4).....	2,496	Central City, (B5).....	302	Eden, (P2).....	418	Goodwin, (R4).....	17	Irene, (P7).....	391
Belvidere, (G6).....	187	Chalkbutte, (D4).....	3	Edgemont, (B7).....	10	Gopher, (F2).....	17	Iron Nation, (K5).....	413
Bemis, (R4).....	83	Chamberlain, (L6).....	1,626	Edson, (E3).....	418	Gorman, (K4).....	17	Iroquois, (O5).....	490
Benclaire, (R6).....	1,642	Chance, (E3).....	39	Egan, (R5).....	103	Govern, (C3).....	17	Isabel, (G3).....	490
Bend, (D5).....	15	Chancellor, (R7).....	232	Elbon, (F5).....	482	Grand Valley, (F2).....	17	Ivanhoe, (B6).....	260
Beresford, (R7).....	15	Chase, (F4).....	51	Elk Mountain, (B6).....	1,483	Grashul, (C5).....	10	James, (N3).....	10
Berton, (P5).....	15	Chelsea, (M3).....	110	Elk Point, (R8).....	779	Grass Rope, (K5).....	17	Janousek, (O8).....	493
Betts, (N6).....	681	Cherry Creek, (F4).....	360	Elkton, (S5).....	13	Greenfield, (R8).....	85	Java, (K3).....	493
Big Springs, (R8).....	47	Chester, (R6).....	630	Ellington, (D2).....	21	Greenway, (K2).....	17	Jefferson, (R8).....	469
Big Stone City, (S3).....	260	Cheyenne Agency, (J3).....	630	Ellis, (R6).....	21	Greenwood, (N8).....	115	Joe Creek, (K5).....	50
Bijou Hills, (L6).....	21	Chilson, (B7).....	149	Elm Creek, (C7).....	7	Gregory, (L7).....	260	Jordan, (J7).....	50
Bison, (E2).....	75	Claire City, (P2).....	271	Elmore, (B5).....	103	Grenville, (P3).....	17	Joubert, (M7).....	70
Bixby, (D3).....	75	Claremont, (N2).....	1,291	Elm Springs, (D5).....	482	Gretna, (K3).....	87	Junius, (P6).....	464
Black Hawk, (C5).....	311	Clark, (O4).....	22	Elrod, (O4).....	40	Groton, (N3).....	946	Kadoka, (F6).....	50
Blaha, (O7).....	150	Clarno, (P6).....	17	Emery, (O6).....	37	Grover, (P4).....	50	Kampeska, (P4).....	20
Blue Bell, (C6).....	322	Clayton, (O7).....	22	Endlee, (D3).....	17	Gustave, (B3).....	17	Karinen, (B2).....	20
Blue Range, (O7).....	31	Clearfield, (K7).....	37	Englewood, (B5).....	182	Hamill, (K6).....	83	Kary, (G7).....	17
Blunt, (J4).....	31	Clear Lake, (R4).....	997	Erwin, (P5).....	96	Hammer, (R2).....	87	Kaylor, (O7).....	135
Boneita Sprs., (E5).....	532	Clough, (D4).....	61	Erwine, (O5).....	627	Hanna, (B5).....	17	Keldron, (F2).....	43
Bonesteel, (M7).....	115	Coal Spring, (F3).....	61	Estelline, (R4).....	324	Hanson, (P7).....	27	Kenel, (J2).....	61
Bonilla, (N4).....	19	Cole, (D2).....	462	Ethan, (N6).....	324	Hanton, (P4).....	241	Kennebec, (K6).....	390
Booge, (R6).....	757	Colman, (R6).....	509	Eureka, (K2).....	1,457	Harding, (B3).....	115	Keyapaha, (J7).....	50
Bovee, (M7).....	10	Colome, (K7).....	615	Evens, (B7).....	120	Harding, (B3).....	229	Keystone, (C6).....	524
Bowdle, (K3).....	311	Colton, (P6).....	275	Fairburn, (C6).....	338	Harding, (B3).....	647	Kidder, (O2).....	200
Bower, (D6).....	150	Columbia, (N2).....	395	Fairfax, (M7).....	100	Hay Creek, (C3).....	19	Kimbball, (M6).....	997
Box Elder, (C6).....	271	Conata, (E6).....	10	Fairpoint, (D4).....	150	Haydraw, (D5).....	17	Kingsbury, (O8).....	160
Bradley, (O3).....	20	Conde, (N3).....	85	Fairview, (R7).....	522	Hayes, (H4).....	51	Kranzburg, (P4).....	47
Brandon, (R6).....	150	Cooper, (E4).....	177	Faith, (E3).....	130	Hayti, (P4).....	370	Kyle, (E7).....	127
Brandt, (R4).....	161	Corona, (R3).....	452	Farmer, (O6).....	43	Hazel, (P4).....	182	Ladelle, (N4).....	35
Brave, (J6).....	19	Corsica, (N7).....	118	Farmington, (D6).....	22	Headlee Ranch, (F6).....	555	Ladner, (B2).....	10
Brentford, (N3).....	790	Corson, (R6).....	53	Farmington, (D6).....	22	Headlee Ranch, (F6).....	555		
Bridger, (E4).....	675	Crandall, (O3).....	10	Farmington, (D6).....	22	Headlee Ranch, (F6).....	555		
Bridgewater, (P6).....		Crandon, (N4).....	10	Farmington, (D6).....	22	Headlee Ranch, (F6).....	555		
Bristol, (O3).....		Craven, (M3).....	17	Farmington, (D6).....	22	Headlee Ranch, (F6).....	555		
		Creighton, (E5).....	17	Farmington, (D6).....	22	Headlee Ranch, (F6).....	555		
		Cresbard, (M3).....	288	Farmington, (D6).....	22	Headlee Ranch, (F6).....	555		

● County seat.

# SOUTH DAKOTA

Total Population 649,961

Lake Andes, (M7).....	785	Minnekahta, (B7).....	84	Peno, (L5).....	25	Selby, (J3).....	599	Vega, (L6).....	65
Lake City, (P2).....	168	Miranda, (H7).....	452	Perkins, (O8).....	833	Seneca, (L3).....	243	Verdon, (N3).....	3,324
Lake Norden, (P4).....	463	Missionhill, (P8).....	195	Philip, (F5).....	150	Shadehill, (E2).....	36	Vermillion, (R8).....	35
Lakeport, (O8).....	17	Mission Ridge, (H4).....	10,633	Piedmont, (C5).....	362	Sheffield, (N5).....	158	Vetrol, (G7).....	659
Lake Preston, (P5).....	886	Mitchell, (N6).....	3,008	Pierpont, (O3).....	4,322	Sheridan, (C5).....	30	Viborg, (I).....	70
Lakeview, (H7).....	15	Mobridge, (J2).....	694	PIERRE, (J5).....	1,007	Sherman, (S6).....	62	Victor, (I).....	313
Landeau, (H2).....	214	Moe, (R7).....	1,017	Pine Ridge, (E7).....	17	Shindler, (R7).....	182	Vienna, (I).....	10
Lane, (N5).....	452	Moenville, (G4).....	20	Plainview, (E4).....	35	Silver City, (B5).....	40,832	Virgil, (N5).....	145
Langford, (O2).....	50	Molan, (P7).....	219	Plankinton, (N6).....	568	Sinai, (P5).....	2,513	Vivian, (J6).....	267
Lantry, (G3).....	50	Monroe, (P7).....	506	Platte, (M7).....	273	Sisseton, (R2).....	79	Volga, (R5).....	632
Laplant, (H3).....	50	Montrose, (P6).....	217	Pleasant Ridge, (E2).....	35	Smithwick, (C7).....	15	Volin, (P8).....	292
La Roche, (J5).....	7,520	Moon, (B6).....	10	Plum Creek, (G5).....	258	Sorum, (D3).....	296	Wagner, (N7).....	1,319
Lauzon, (B6).....	310	Moreau Jc., (H2).....	23	Poinsette, (P4).....	37	South Shore, (P3).....	591	Wakonda, (P7).....	451
Lead, (B5).....	1,781	Morefield, (R6).....	17	Pollock, (J2).....	189	South Sioux Falls, (R6).....	11	Wakpala, (H2).....	127
Lebanon, (K3).....	1,164	Moritz, (R4).....	15	Porcupine, (E7).....	22	Spain, (O2).....	2,139	Walker, (G2).....	21
Lenmon, (E2).....	795	Morning Star, (P7).....	405	Potato Creek, (F6).....	265	Spearfish, (B5).....	617	Wall, (E6).....	500
Lennox, (R7).....	221	Morristown, (F2).....	10	Powell, (G5).....	114	Spencer, (O6).....	31	Wallace, (P3).....	193
Leola, (M2).....	344	Mossman, (H3).....	680	Presho, (J6).....	206	Spink, (R8).....	107	Wanmaker, (G7).....	12
Leslie, (C4).....	158	Mound City, (K2).....	15	Pringle, (B6).....	22	Spottswood, (M4).....	367	Ward, (R5).....	84
Lesterville, (O7).....	221	Mt. Vernon, (N6).....	15	Promise, (H3).....	258	Springfield, (N8).....	38	Warner, (M3).....	153
Letcher, (N6).....	344	Mud Butte, (D4).....	680	Provo, (B7).....	258	Stamford, (C6).....	161	Wasta, (D5).....	150
Lightcap, (G2).....	158	Murchison, (C3).....	22	Pukwana, (L6).....	258	Stephan, (K5).....	107	Watanga, (G2).....	150
Lily, (O3).....	221	Murdo, (H6).....	15	Quinn, (E5).....	22	Stevens, (R8).....	361	Watertown, (I).....	43
Lindsay, (H4).....	39	Murphy, (C5).....	22	Ralph, (C2).....	258	Stickney, (M6).....	177	Wecota, (L).....	31
Little Eagle, (H2).....	75	Mystic, (B5).....	84	Ramona, (P5).....	258	Stockholm, (R3).....	205	Wellsburg, (F5).....	63
Lodgepole, (D2).....	83	Nahant, (B5).....	30	Randolph, (N3).....	258	Stoneville, (D4).....	63	Wendte, (H5).....	303
Longlake, (L2).....	17	Nahon, (N3).....	84	Rapid City, (C5).....	258	Storla, (M6).....	15	Wentworth, (R5).....	516
Longvalley, (F7).....	83	Nansen, (O5).....	147	Rauville, (P3).....	258	Strandburg, (R3).....	459	Wessington	17
Loomis, (N6).....	43	Naples, (O4).....	344	Ravinia, (N7).....	258	Stratford, (N3).....	391	Westover, (H6).....	17
Lower Brule, (K5).....	90	Nemo, (B5).....	683	Raymond, (O4).....	258	Stratton, (H2).....	165	Westport, (M2).....	253
Lowry, (K3).....	89	Newark, (O2).....	40	Redelm, (F3).....	258	Strool, (D3).....	84	Weta, (F6).....	109
Loyalton, (L3).....	31	New Effington, (R2).....	214	Redfern, (B5).....	258	Sturgis, (B5).....	3,008	Wetoka, (M2).....	30
Lucas, (L7).....	18	Newell, (C4).....	212	Redfield, (N4).....	258	Sulphur, (D4).....	15	Wheeler, (M7).....	559
Ludlow, (C2).....	50	New Holland, (M7).....	212	Redig, (C3).....	258	Summit, (P3).....	459	White, (R5).....	75
Lyman, (K6).....	62	New Underwood, (D5).....	212	Redowl, (D4).....	258	Swett, (E7).....	17	White Butte, (E2).....	75
Lyons, (R6).....	62	Nisland, (C4).....	212	Ree Heights, (L4).....	258	Tabor, (O8).....	391	Whitedeer, (F2).....	8
Lyonville, (M6).....	626	Nora, (R8).....	212	Reliance, (K6).....	258	Tacoma Park, (N2).....	67	Whitehorse, (H3).....	496
McClure, (J5).....	626	Norbeck, (L3).....	212	Reva, (C2).....	258	Tatanka, (G2).....	512	White Lake, (M6).....	123
McCook, (S8).....	626	Norris, (G7).....	212	Revillo, (R3).....	258	Tea, (R7).....	171	White Owl, (E4).....	220
McIntosh, (G2).....	626	Northville, (M3).....	212	Richland, (R8).....	258	Templeton, (M5).....	314	White River, (H6).....	267
McKain, (R5).....	626	Nowlin, (G5).....	212	Richmond, (M2).....	258	Tennis, (L4).....	913	Whitlocks Crossing, (J3).....	16
McLaughlin, (H2).....	5,018	Nunda, (P5).....	212	Ridgeview, (H3).....	258	Terry, (B5).....	72	Willett, (B2).....	427
Madison, (P6).....	63	Oacoma, (L6).....	212	Robey, (M6).....	258	Teton, (H5).....	244	Willow Lake, (O4).....	628
Mahto, (H2).....	63	Oahe, (J5).....	212	Rochford, (B5).....	258	Thomas, (P4).....	180	Winfred, (P6).....	245
Maltby, (D3).....	167	Oelrichs, (C7).....	212	Rockerville, (C6).....	258	Texsaw, (H6).....	84	Winner, (K7).....	2,426
Manchester, (O5).....	62	Oglala, (D7).....	212	Rockham, (M4).....	258	Tilford, (C5).....	6	Winship, (M2).....	5
Manderson, (D7).....	62	Oglaia, (D7).....	212	Rockyford, (E7).....	258	Timber Lake, (H3).....	121	Wist, (P2).....	9
Manila, (G5).....	117	Okaton, (H6).....	212	Roscoe, (L3).....	258	Tinton, (A5).....	121	Witten, (J7).....	410
Mansfield, (M3).....	117	Okoboji, (J4).....	212	Rosholt, (R2).....	258	Tolstoy, (K3).....	410	Wolsey, (N5).....	414
Mapleleaf, (H2).....	24	Okreek, (J7).....	212	Roslyn, (P2).....	258	Toronto, (R4).....	314	Wood, (J6).....	1,050
Marcus, (E4).....	24	Ola, (L6).....	212	Roswell, (O6).....	258	Trail City, (H3).....	240	Worthing, (R7).....	291
Marindahl, (P7).....	765	Oldham, (P5).....	212	Roubaux, (B5).....	258	Trent, (R6).....	16	Wounded Knee, (D7).....	37
Marion, (P7).....	10	Olivet, (O7).....	212	Rousseau, (K5).....	258	Tripp, (N7).....	95	Yahota, (P4).....	156
Marlow, (P2).....	10	Onaka, (L3).....	212	Rowena, (R6).....	258	Trojan, (B5).....	251	Yale, (O5).....	6,798
Martin, (F7).....	1,013	Onida, (K4).....	212	Royal Center, (D4).....	258	Troy, (R3).....	486	Yankton, (P8).....	16
Marvin, (R3).....	164	Opai, (D7).....	212	Royhl, (P5).....	258	Tulare, (N4).....	244	Zenker, (M2).....	16
Marty, (N8).....	18	Oral, (C4).....	212	Rudolph, (N3).....	258	Tunnel, (B5).....	244	Zenon, (D3).....	16
Mason, (B3).....	18	Ordway, (I).....	212	Rumford, (B7).....	258	Turton, (N3).....	180		
Mathews, (P5).....	18	Oreville, (B6).....	212	Running Water, (O8).....	258	Tuthill, (G7).....	84		
Maurine, (E3).....	70	Orient, (L4).....	212	Rutland, (P5).....	258	Twilight, (C4).....	6		
Meadow, (E2).....	144	Ortley, (P3).....	212	St. Charles, (L7).....	258	Twin Brooks, (R3).....	121		
Meckling, (R8).....	332	Osceola, (O5).....	212	Saint Francis, (H7).....	258	Tyndall, (O8).....	1,289		
Melletite, (N3).....	332	Ottumwa, (G5).....	212	Salem, (P6).....	258	Union Center, (D4).....	16		
Melham, (O4).....	966	Osowan, (D5).....	212	Sanator, (B6).....	258	Unityville, (P6).....	102		
Menno, (P7).....	282	Packton, (O7).....	212	Sansarc, (H4).....	258	Usta, (E3).....	95		
Midland, (C5).....	21	Parade, (C3).....	212	Savoy, (B5).....	258	Utica, (P8).....	251		
Midway, (P7).....	2,745	Parker, (P7).....	212	Scenic, (E6).....	258	Vale, (C4).....	396		
Milbank, (R3).....	110	Parkeston, (O7).....	212	Schamber, (G6).....	258	Valley Springs, (S6).....	30		
Milesville, (F5).....	110	Parmelee, (G7).....	212	Scotland, (O7).....	258	Van Metre, (H5).....	564		
Millard, (L3).....	102	Patricia, (C7).....	212			Vayland, (M5).....	564		
Millboro, (K7).....	1,460	Paxton, (L7).....	212			Veblen, (P2).....	486		
Miller, (L4).....	31	Pedro, (E5).....	212						
Milltown, (O7).....	61	Peever, (R2).....	212						
Mina, (M3).....	61								

● County seat.



for feeble-minded at Redfield. *Soldiers' Home* at Hot Springs. *Prison*, Penitentiary at Sioux Falls.

**Education.** One-room schoolhouses sprang up in the South Dakota country almost as soon as the first permanent settlers arrived. Many early schoolhouses were made of logs and had dirt floors. Sod schoolhouses were common in regions far from the streams, where there were no logs to be had.

Today, South Dakota has a well-organized system of rural and city elementary and high schools. Schools are supervised by the state superintendent of public instruction, and by county superintendents and district boards of education. South Dakota has one of the highest ratios among the states for persons who read and write. Consolidated schools have taken the place of the one-room schools, but the teaching of many pupils in one school has been difficult because the population is so scattered. School districts are required by state law to pay for the transportation of pupils that live more than four miles from the nearest school. Grammar-school education is compulsory for children from seven to sixteen years of age. Vocational education in farming and home economics is given in many high schools.

The accredited colleges and universities of South Dakota are discussed under their own names in *THE WORLD BOOK ENCYCLOPEDIA*. A list of these colleges and universities will be found in the *Related Subjects* at the end of this article.

**Libraries.** One of the oldest public libraries in South Dakota is the Carnegie Free Public Library of Sioux Falls, which was founded in 1879. It has excellent collections on history, biography, art, and Catholicism. The best collection on South Dakota history is at the State Historical Library in Pierre. Several county libraries have been set up. The South Dakota Free Library Commission, which was created in 1913, has a library at Pierre which mails books to communities, groups of citizens, and individuals. There are over a hundred library systems in the state.

**Arts and Crafts.** Probably the earliest artists in the South Dakota country were the Sioux Indians. They decorated animal skins with porcupine quills and native dyes. White traders brought beads to trade for the skins. The Sioux used these beads as decoration, and today these Indians are famous for their beautiful beadwork. The earliest painter in the region was George Catlin, who came by steamboat in 1832. Many of his paintings of Indian life are shown in the Smithsonian Institution at Washington, D.C. Charles Bodmer, also a painter of Indians, visited the country soon after Catlin.

Several writers have gained inspiration for their work from personal experiences with the hardships of pioneer life in the Dakota country. O. E. Rølvaag wrote *Giants in the Earth*, a story of pioneers in eastern South Dakota. Hamlin Garland, who lived in the state for a time, wrote of his experiences in *Son of the Middle Border* and *Daughter of the Middle Border*.

**Religion.** Catholic and Protestant missionaries who came to teach the Indians during the early 1800's brought the Christian religion to the region. Father De Smet, the most famous Catholic missionary to the Indians of the West, was among them. Stephen Riggs,

valleys in or near the Black Hills. The Spearfish Valley is especially noted for its fine apples and vegetables. Nursery products are grown in Yankton, Brookings, and Minnehaha counties, in the east, and in Pennington County, in the west.

**Manufactures.** The chief manufacturing industries are those which process farm products. Meat packing is the most important industry. The largest meat-packing plant is at Sioux Falls. Others are located at Huron, Watertown, Mitchell, and Rapid City. The dressing and packing of poultry is centered in the eastern cities, where there are also many plants which make butter, ice cream, and other dairy products.

Other industries include the refining of beet sugar, the milling of flour and livestock feed, and the manufacture of bakery products.

A state-owned plant at Rapid City manufactures Portland cement, and a factory at Belle Fourche makes brick and tile. There are large lumber mills at Rapid City, Spearfish, and Custer, and many smaller ones in the Black Hills. Specially colored and designed gold jewelry is made at Deadwood.

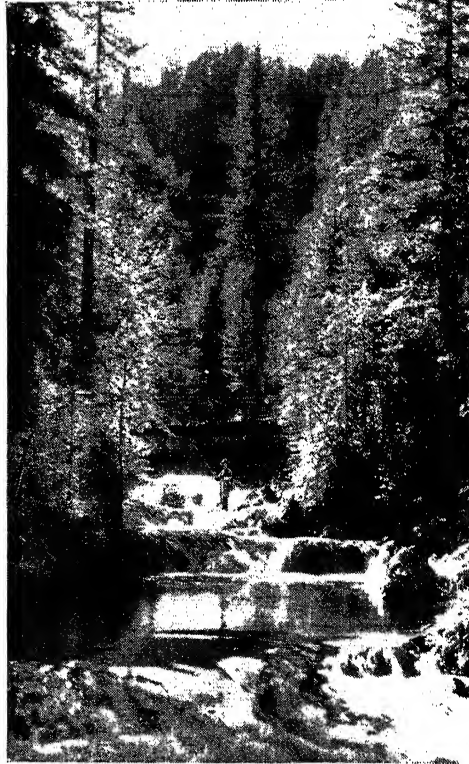
**Minerals.** Mining is centered in the Black Hills, although there are some undeveloped mineral deposits in other parts of the state. Most of the gold comes from the Homestake Mine at Lead, and gold is far more valuable than other mineral products in the state. Silver is a by-product of gold mining. Feldspar and mica are mined in large amounts in the Black Hills region. Other minerals in the Black Hills include lithium, tin, arsenic, tungsten, beryl, iron, vanadium, and lead, some of which have been mined.

The state contains widespread deposits of bentonite, which is a clay used in making soap, oils, medical dressings, plaster, and other products. Only those deposits of bentonite near the Black Hills are mined. Limestone is quarried around Rapid City. It is used in the manufacture of cement. Sandstone is quarried in the southern Black Hills. Quartzite is taken from the southeast Black Hills, and granite from the northeast. One of the largest deposits of low-grade manganese ore in the United States lies along the Missouri River in the south-central part of the state. This ore is an important alloy in iron and steel.

**Transportation.** The Sioux rode horses obtained from the Spanish in the Southwest, to travel the vast distances in South Dakota. The early fur trappers dragged keelboats by hand up the Missouri. Later, fur traders

used flat-bottomed steamboats. In the gold-rush days, stagecoaches and bull trains, which were wagons pulled by oxen or cattle, carried goods and passengers from the steamboat landings to the mines. This period of transportation ended with the coming of the railroads, which entered the state in 1872. Railroads reached the Missouri River in 1880, and the Black Hills in 1886. Today, there are more than 4,000 miles of railroads in the state.

Large-scale modern highway construction began in 1919, when the legislature approved a state trunk highway system. There are now about 2,500 miles of hard roads in the state.



**Spearfish River in South Dakota** rushes through a beautiful canyon in the Black Hills. Trout and other game fish abound in the sparkling streams.

**Press and Radio.** Newspapers, radio, and other means of communication are especially important in a state whose population is as scattered as that of South Dakota. The first newspaper in the region was the *Dakota Democrat*, which was established at Sioux Falls in 1859. It was supported by the Dakota Land Company to persuade people to settle in the Dakotas. The oldest newspaper in the state today is the *Yankton Press and Dakotan*, which was founded as the *Weekly Dakotan* in 1861, the same year that the Dakota territory was formed. The largest newspapers are the *Argus Leader*, published in Sioux Falls, and the *Rapid City Journal*. About 240 newspapers, of which sixteen are dailies, and about twenty periodicals are published in the state.

The first radio station in South Dakota was WCAT, established by the School of Mines and Technology at Rapid City in 1921. Other leading radio broadcasting stations of South Dakota include those at Aberdeen, Sioux Falls, Yankton, and Rapid City.

### Social and Cultural Achievements

**Educational Institutions:** *Teachers' Colleges*, Black Hills Teachers College (founded, 1883), at Spearfish; Eastern State Normal School (1883), at Madison; Northern State Teachers College, at Aberdeen (1901); Southern State Normal School, at Springfield (1897). *Other Colleges and Universities*, Augustana, Huron, and Yankton colleges; Dakota Wesleyan University; State School of Mines and Technology; State College; University of South Dakota.

**State Welfare, Correctional, and Penal Institutions:** *Children*, training school at Plankinton. *Physically handicapped*, School for the Deaf at Sioux Falls; School for the Blind at Gary; tuberculosis sanatorium, near Custer. *Mentally handicapped*, state hospital at Yankton; school

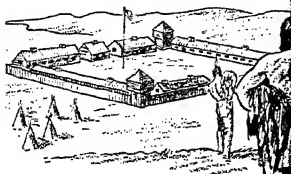


#### TERRITORY CLAIMED FOR FRANCE

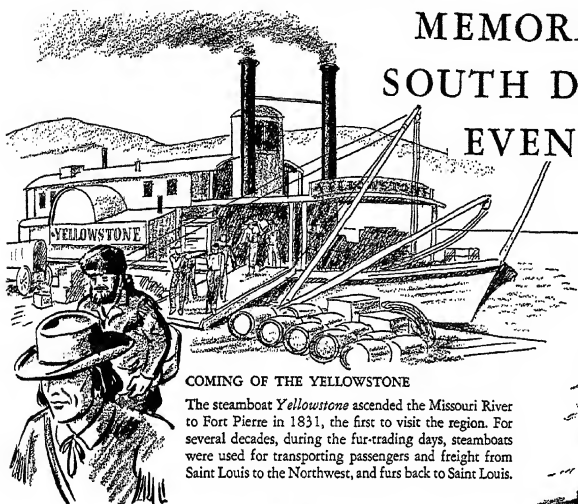
In 1743, François Verendrye with his brother and two trappers visited South Dakota on their return from an unsuccessful search for the western sea. On a hill overlooking the Missouri and Bad rivers, on the site of modern Fort Pierre, they buried a lead plate claiming the region for France. The plate was discovered in 1913 by school children.

#### FIRST PERMANENT SETTLEMENT

At the junction of the Missouri and the Bad (then the Teton or Little Missouri) rivers, Joseph La Framboise, a French fur trader, built a trading post in 1817. Near this site, the trading post Fort Pierre and the town of the same name were built in later years.



## MEMORABLE SOUTH DAKOTA EVENTS

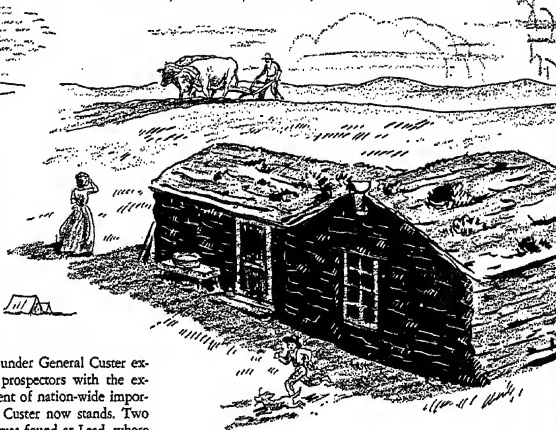


#### COMING OF THE YELLOWSTONE

The steamboat *Yellowstone* ascended the Missouri River to Fort Pierre in 1831, the first to visit the region. For several decades, during the fur-trading days, steamboats were used for transporting passengers and freight from Saint Louis to the Northwest, and furs back to Saint Louis.

#### THE LAND

Beginning in the late 1850's, hardy settlers came to the southeastern part of the state, where they farmed the rich river valleys. They also founded the towns of Yankton, Vermillion, Elk Point, and Sioux Falls.



#### BLACK HILLS GOLD RUSH

In 1874, when a military party under General Custer explored the Black Hills region, prospectors with the expedition discovered gold (an event of nation-wide importance) near where the town of Custer now stands. Two years later, the Homestake vein was found at Lead, where the largest gold mine on this hemisphere is now located.

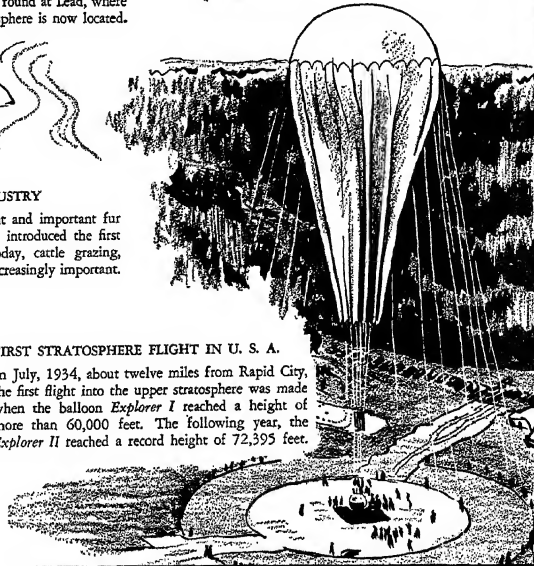


#### BEGINNING OF THE CATTLE INDUSTRY

In 1812, Manuel Lisa, an Indian agent and important fur trader who had a post near Big Bend, introduced the first domestic cattle to South Dakota. Today, cattle grazing, stock feeding, and sheep grazing are increasingly important.

#### FIRST STRATOSPHERE FLIGHT IN U. S. A.

In July, 1934, about twelve miles from Rapid City, the first flight into the upper stratosphere was made when the balloon *Explorer I* reached a height of more than 60,000 feet. The following year, the *Explorer II* reached a record height of 72,395 feet.



It was first given by monks of the Cappenburg Monastery about the middle 1200's. Nearby is *Spearfish Canyon*, a mountain ravine cut deep into layers of limestone and sandstone, and noted for its beauty.

**Stratosphere Bowl**, near Rapid City. Scene of a world record stratosphere flight in November, 1935. This flight was sponsored by both the United States Army Air Corps and the National Geographic Society. Major William E. Kepner, Captain Orvil A. Anderson, and Captain Albert W. Stevens reached an altitude of 72,395 feet in their giant balloon, *Explorer II*.

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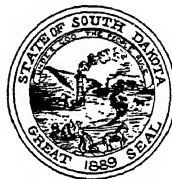
### Famous South Dakotans

Several persons, native to South Dakota or doing their most important work there, have won state, national, or international fame. They include:

**Beadle, William H. H.** (1838-1915), born in Parke County, Indiana. Father of the present-day permanent school fund in South Dakota. He came to Dakota Territory as surveyor general in 1860, and served as territorial superintendent of public instruction from 1879 to 1885. He worked for the preservation of the school lands in Dakota. The first normal schools were founded in the state through his work, and many public schools were established.

**Clark, Charles Badger** (1883- ), born at Albia, Iowa. He became famous through his cowboy ballads, which were published in *Sun and Saddle Leather* and *Grass Grown Trails*. He also wrote a book of verse, *Skyline and Wood Smoke*, which was inspired by outdoor life in the Black Hills, and several short stories.

### State Symbols and Events



**State Seal.** In the center is the Missouri River, with a steamboat representing fifty years of steamboat history. On the left are a range of hills and a smelter, symbols of the mining industry. On the right are a herd of cattle and a field of corn, representing farming.

**State Flag.** On a blue field, in the center, is a blazing gold sun with "South Dakota," in an arc of gold letters above it. Below the sun is an arc of gold letters which reads "The Sunshine State." The flag is trimmed with a gold fringe. See FLAG (color plate, Flags of the States).

**State Motto.** Under God the people rule.

**State Bird.** Ring-necked pheasant. See BIRD (color plate, Game Birds).

**State Flower.** Pasqueflower. See FLOWER (color plate, Prairie Flowers).

**State Tree.** None.

**State Song.** Popular but unofficial, "South Dakota," by Willis E. Johnson.

**Annual State Events.** Among the interesting events on the state calendar are:

*Farm Home Day* at Brookings, in June (no fixed date).

*Black Hills Passion Play* at Spearfish, two or three times a week from about the middle of June to the middle of September.

*Gold Discovery Days* at Custer, fourth week in July; celebrating the discovery of gold by the Custer expedition in 1874.

*Black Hills Roundup* at Belle Fourche, July 3-5; a rodeo and Wild West celebration.

*Days of '76* at Deadwood, first week in August; held in memory of gold-rush days.

*State Fair* at Huron, second week in September.

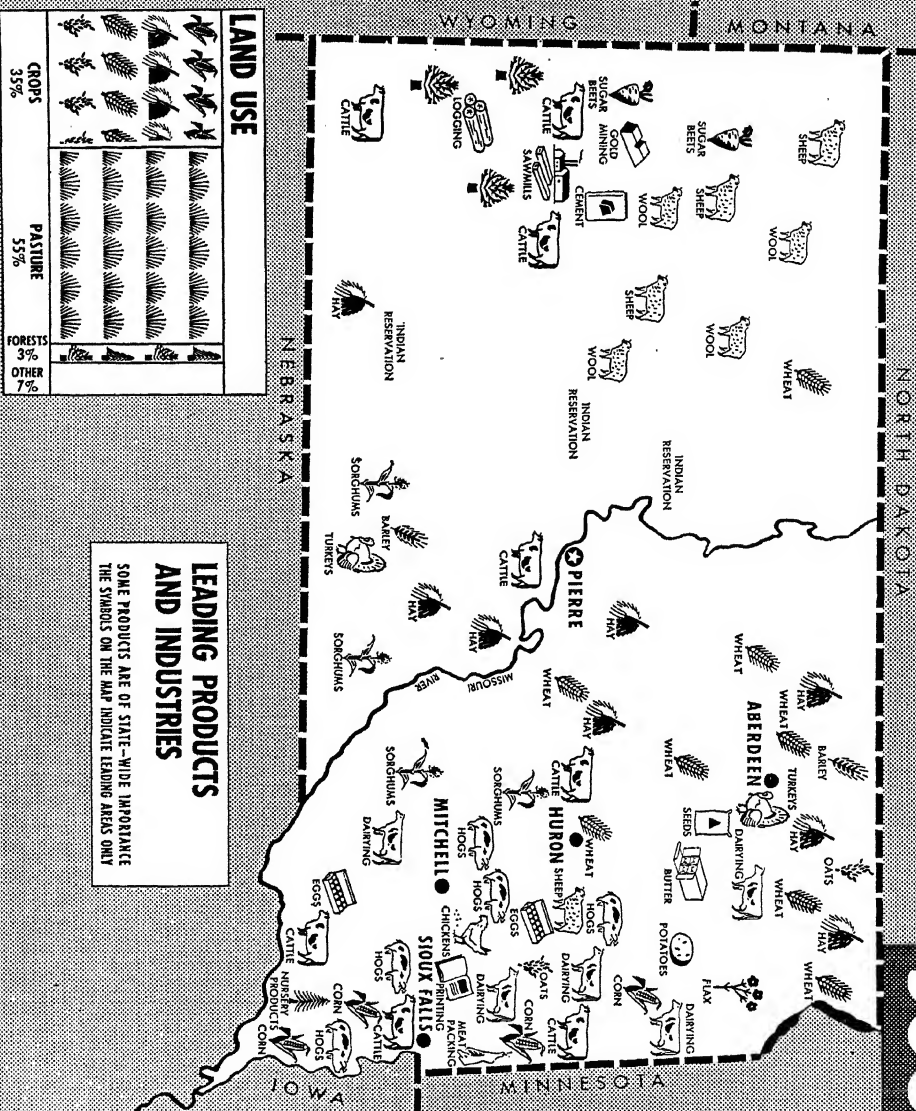
*Corn Palace Festival* at Mitchell, fourth week in September.

*Pioneer Day* at Yankton, the capital of the Dakota Territory, in October (no fixed date).

### History

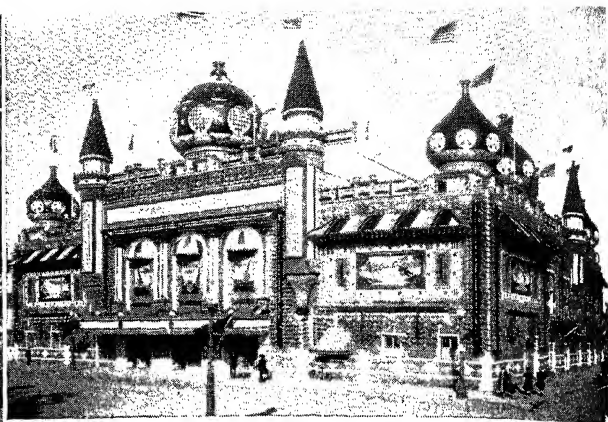
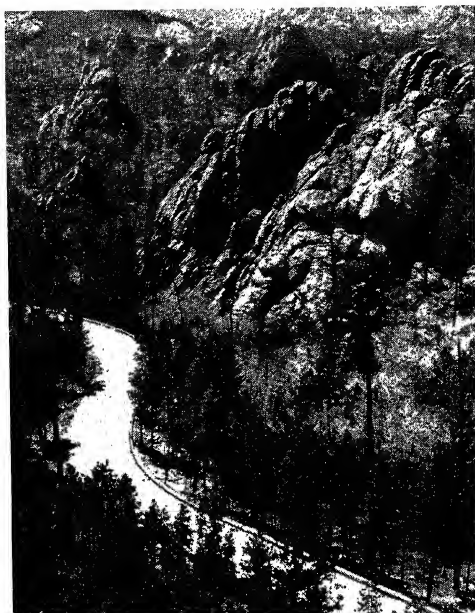
1743 François and Louis-Joseph Vérendrye buried a lead plate at a point near the site of Fort Pierre, and claimed the region for France.

# SOUTH DAKOTA



Based on latest U.S. Government statistics, prepared for the exclusive use of the WORLD BOOK ENCYCLOPEDIA by Fitzgibbon Corporation

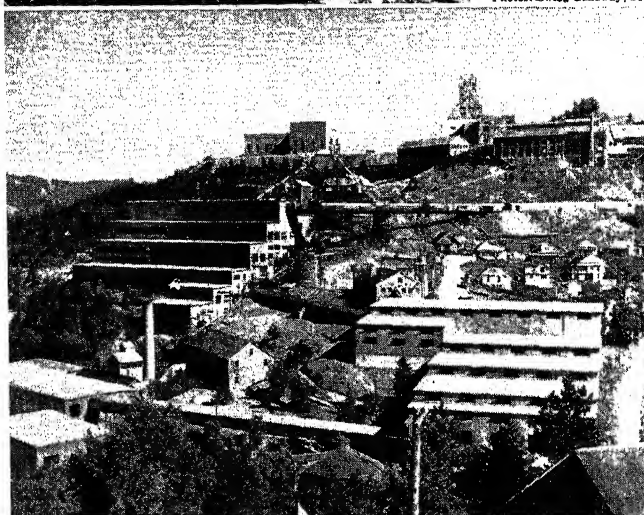




# HILL AND PLAIN SCENES

*Left:* This splendid highway leads deep into the Black Hills, noted for their picturesque rock formations and towering pines. *Above:* The gaily decked Corn Palace, at Mitchell. *Below left:* The Homestake Gold Mine at Lead, largest of its kind in North America, has yielded more than \$3,000,000,000 worth of the precious metal. *Below right:* The Capitol, at Pierre. *Bottom:* Large flocks of sheep are grazed on the hillsides of the Short Pines country of South Dakota, near Buffalo in Harding County.

Photos: Ewing Galloway; South Dakota State Highway Commission.



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voted Republican in national elections, except in 1912, when it favored Theodore Roosevelt's "Bull Moose" movement, and in 1932 and 1936, when it voted for Franklin D. Roosevelt. See POLITICAL PARTY (chart).

### Famous South Dakotans

Several persons, native to South Dakota or doing their most important work there, have won state, national, or international fame. They include:

**Beadle, William H. H.** (1838-1915), born in Parke County, Indiana. Father of the present-day permanent school fund in South Dakota. He came to Dakota Territory as surveyor general in 1869, and served as territorial superintendent of public instruction from 1879 to 1885. He worked for the preservation of the school lands in Dakota. The first normal schools were founded in the state through his work, and many public schools were established.

**Clark, Charles Badger** (1883- ), born at Albia, Iowa. He became famous through his cowboy ballads, which were published in *Sun and Saddle Leather* and *Grass Grown Trails*. He also wrote a book of verse, *Skyline and Wood Smoke*, which was inspired by outdoor life in the Black Hills, and several short stories.

### State Symbols and Events



**State Seal.** In the center is the Missouri River, with a steamboat representing fifty years of steamboat history. On the left are a range of hills and a smelter, symbols of the mining industry. On the right are a herd of cattle and a field of corn, representing farming.

**State Flag.** On a blue field, in the center, is a blazing gold sun with "South Dakota," in an arc of gold letters above it. Below the sun is an arc of gold letters which reads "The Sunshine State." The flag is trimmed with a gold fringe. See FLAG (color plate, Flags of the States).

**State Motto.** Under God the people rule.

**State Bird.** Ring-necked pheasant. See BIRD (color plate, Game Birds).

**State Flower.** Pasqueflower. See FLOWER (color plate, Prairie Flowers).

**State Tree.** None.

**State Song.** Popular but unofficial, "South Dakota," by Willis E. Johnson.

**Annual State Events.** Among the interesting events on the state calendar are:

*Farm Home Day* at Brookings, in June (no fixed date).

*Black Hills Passion Play* at Spearfish, two or three times a week from about the middle of June to the middle of September.

*Gold Discovery Days* at Custer, fourth week in July; celebrating the discovery of gold by the Custer expedition in 1874.

*Black Hills Roundup* at Belle Fourche, July 3-5; a rodeo and Wild West celebration.

*Days of '76* at Deadwood, first week in August; held in memory of gold-rush days.

*State Fair* at Huron, second week in September.

*Corn Palace Festival* at Mitchell, fourth week in September.

*Pioneer Day* at Yankton, the capital of the Dakota Territory, in October (no fixed date).

### History

1743 François and Louis-Joseph Vérendrye buried a lead plate at a point near the site of Fort Pierre, and claimed the region for France.

- 1785 Pierre Dorion began fur trade on the James River.
- 1804 Lewis and Clark passed through the Dakota country.
- 1817 Fort Teton built near present site of Fort Pierre, first settlement of Dakota.
- 1831 Pierre Chouteau, Jr., brought first steamboat up the Missouri River to Fort Tecumseh (later Fort Pierre).
- 1857 First farm settlements made.
- 1861 Dakota Territory created.
- 1868 Red Cloud Indian War ended by Laramie Treaty.
- 1872 First railroad reaches territory.
- 1875 Gold rush to the Black Hills began.
- 1889 South Dakota admitted to the Union.
- 1890 Battle of Wounded Knee, last armed battle between Indians and white men in the United States.
- 1910 New capitol dedicated at Pierre.
- 1927 Mount Rushmore Memorial begun by Gutzon Borglum.
- 1935 World record stratosphere flight made near Rapid City.
- 1941 Mineral and farm production organized for war; several military installations set up in the state.
- 1945 Mining and agriculture restored to peacetime production.

**Exploration and Early Settlement.** The first white men who are known to have visited the South Dakota country were François and Louis-Joseph Vérendrye, French explorers. In 1743, when they were returning from an unsuccessful search for a route to the Pacific Ocean, they buried a lead plate near the site of Fort Pierre, and claimed the region for France.

In 1803, the United States acquired the territory as part of the Louisiana Purchase. The open prairies were mainly the home of the warlike Dakota, or Sioux, Indians.

The explorers, Lewis and Clark, crossed the region in 1804, and again on their return in 1806. The Dakota country was important in fur-trading days because the Missouri River was the chief route between the beaver region of the high plains and the Rockies, and the fur market at St. Louis, Mo. This period began before 1800 and lasted until 1855. John Jacob Astor's land expedition visited the region to the mouth of the Columbia in 1811. A group under General William Ashley visited the region in 1823, and in 1831, Pierre Chouteau came to Fort Pierre by steamboat. Many others connected with the fur business came to the Fort Pierre region. By 1855, when the Federal Government bought Fort Pierre for a military post, the fur trade had ended.

The first permanent farming settlers came to the southeastern part of the territory in 1857. They founded several towns, including Yankton, Sioux Falls, Vermillion, and Elk Point. The Dakotas were part of the Missouri Territory until 1820. The eastern section was in turn part of Michigan, Wisconsin, Iowa, and Minnesota. From 1854 to 1861, the western part of the present states of North Dakota and South Dakota was included in Nebraska Territory.

**Territorial Days.** In 1861, the Territory of Dakota was organized. It included North Dakota, South Dakota, Montana, and part of Wyoming. In 1869, the territory was reduced to include the present Dakota states. The Homestead Act of 1862 encouraged settlement, but the War between the States and troubles with the Indians delayed progress.

In 1875, a gold rush to the Black Hills started with the report of the discovery of gold by General George Custer's military expedition to the region the year before. The discovery of the great Homestake Lode at Lead came out of the gold rush. Deadwood, which was the center of placer-mining operations, became a notorious "wide-open" mining town. Such "wild West" characters as Wild Bill Hickok, Calamity Jane, Poker Alice, and others lived in Deadwood for a time.

Before the gold rush, and afterward, the territory was upset by wars with the Sioux Indians. The Red Cloud War was settled by the Laramie Treaty of 1868. By this treaty, all the lands between the Missouri River and the Big Horn Mountains of Wyoming were reserved for the Sioux. In spite of the treaty, the gold rush brought a flood of prospectors and other white men into the Black Hills. This caused a series of uprisings led by the famous chiefs Spotted Tail, Crazy Horse, and Sitting Bull. The last warfare between the Indians and the whites took place at Wounded Knee in southern South Dakota in 1890, after Sitting Bull was killed.

During the 1870's, settlers began demanding that Dakota be divided into two territories of equal size. In 1883, the southern half of Dakota was the first to draw up a constitution. It applied for admission to the Union in 1885. In 1887, the people voted to divide the territory into two states. Two years later, the constitution of 1885 was adopted with slight changes. On November 2, 1889, South Dakota became a state. North Dakota was admitted to the Union at the same time.

**Progress as a State.** The new state made progress, in spite of grasshoppers, drought, hailstorms, and hot winds that damaged the crops. Railroads were built in many parts of the state. This brought new settlers, who, in turn, caused the railroads to extend their lines into the new settlements. Fields of wheat and corn increased in number east of the Missouri River, and cattle and sheep ranching began west of the river. The mining settlements in the Black Hills grew in number, and the lumbering and tourist trade developed rapidly.

In 1917 the state began a number of experiments in state socialism. Nearly all the plans were given up in later years. Among the experiments were a system of rural credits through which many millions of dollars were lent to farmers, a state guaranty of bank deposits, a state-owned coal mine and cement plant, and a state hail-insurance system.

World War II brought an increase in agricultural production, and in mica and feldspar mining in the Black Hills. The gold mines were not worked during World War II. Several military bases were established, including an army air forces technical school at Sioux Falls, an army flying school at Rapid City, and an ordnance depot at Provo.

R.V.H.

**Related Subjects.** The reader is also referred to:

#### BIOGRAPHY

Chouteau (Pierre)                      Sitting B  
Lawrence, Ernest Orlando

#### CHIEF PRODUCTS

Alfalfa	Flax	Rye
Barley	Gold	Sorghum
Cattle	Lithium	Wheat
Corn	Oats	

## CITIES

Aberdeen	Pierre	Sioux Falls
Lead	Rapid City	Yankton

## COLLEGES AND UNIVERSITIES

Augustana College	South Dakota State Col- lege
Dakota Wesleyan University	South Dakota State School of Mines and Technology
Huron College	Yankton College
South Dakota, University of	
South Dakota Northern State Teachers College	

## PHYSICAL FEATURES

Agassiz, Lake	Black Hills
Bad Lands	Minnesota River
Belle Fourche Dam	Missouri River

## UNCLASSIFIED

Food (Famous Foods of the States)	Mount Rushmore Memorial
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## Books for Younger Readers

- HUNKINS, RALPH VALENTINE, and LINDSEY, J. C. *South Dakota; Its Past, Present, and Future*. Macmillan, 1932. History and geography of the state.
- McKOWN, GRETCHEN, and GLEESON, F. S. *All the Days were Antonia's*. Viking, 1939. Deadwood, Dakota in the 70's and 80's as Antonia, an eastern girl, saw it.
- McNEELY, MARIAN HURD. *Jumping-off Place*. Cadmus, 1940. Four orphans take up a claim in Dakota.
- ROUNDS, GLEN. *Pay Dirt*. Holiday, 1938. Sluicing gold in the Black Hills.
- SCHELL, HERBERT SAMUEL. *South Dakota; Its Beginnings and Growth*. American Book, 1942. History of the state for young persons.
- VANDERPOL, JEANNETTE A., and McCAIN, L. P. *Stories for Young Dakotans*. Will A. Beach Printing Co., Sioux Falls, S.D., 1942. Men and women who changed the lonely prairie into the South Dakota of today.
- WILDER, LAURA INGALLS. *Long Winter*. Harper, 1940. *Little Town on the Prairie*. 1941. *These Happy Golden Years*. 1943. Excellent stories of the Ingalls family, pioneers in the Dakota territory.

## Books for Older Readers

- DOWNING, JOHN HYATT. *Harvest in Late*. Morrow, 1944. Life on the land itself and in a South Dakota small town. *Hope of Living*. Putnam, 1939. A woman's determination to become a farmer in South Dakota.
- LANE, ROSE WILDER. *Free Land*. Longman's, 1938. Life of a young settler and his bride.
- RÖLVAAG, ØLE EDVART. *Giants in the Earth; a Saga of the Prairie*. Blue Ribbon Books, 1937. Norwegian immigrants on a Dakota farm. *Peder Victorious*. Harper, 1928. A sequel to *Giants in the Earth*, depicting the conflict between the older conservative generation and the younger one. *Their Fathers' God*. 1931. Concluding volume in Rölvaag's trilogy of Norwegian pioneers.
- South Dakota Guide*. South Dakota Guide Commission, 1938. (American Guide series.) Historical background and descriptions of modern life.
- STUTENROTH, STELLA MARIE. *Daughters of Dacotah*. Educator Supply Co., 1942. Biographies of women who helped to build the state.
- WENDT, LLOYD. *Bright Tomorrow*. Bobbs, 1945. A boy grows to manhood in this novel of Gann, South Dakota.
- An Outline suitable for South Dakota will be found with the article "State."

## Questions

Where in South Dakota is there a famous work of modern sculpture many times larger than the Sphinx of Egypt? Why is it sometimes called "the shrine of democracy"?

What noted Indian fighter was responsible for the discovery of gold in South Dakota? In what part of the state is the largest gold mine in the Americas?

What religious drama, first given long before the discovery of America, is now presented at Spearfish?

Where in the state are some of the largest deposits of lithium in the world?

What importance have the following in the development of South Dakota: the Vérendryes; Louisiana Purchase; John Jacob Astor; Pierre Chouteau; General George Custer; Deadwood; the Homestead Act of 1862; the gold rush of 1875; the Battle of Wounded Knee?

**SOUTH DAKOTA, UNIVERSITY OF**, is a state-supported coeducational school at Vermillion, S.D. The university includes the college of arts and sciences, the college of fine arts, the schools of business administration, education, law, and medicine, and a graduate school.

Students live in dormitories, fraternity houses, and approved rooming houses. Courses lead to degrees of bachelor of arts, fine arts, and science; master of arts; and bachelor of laws. The school was first opened in 1882. Its enrollment averages about 1,000. E.G.T.

**SOUTH DAKOTA NORTHERN STATE TEACHERS COLLEGE** is a state-controlled coeducational institution at Aberdeen, S.D. It was chartered as the Industrial School Institute of Technology in 1899, and received its present name in 1939. Students live in the campus dormitories or in approved rooming houses. Average enrollment is about 1,000. N.E.S.

**SOUTH DAKOTA STATE COLLEGE** is a state-controlled, coeducational technological college at Brookings, S.D. The school includes colleges of agriculture and mechanic arts, and offers instruction in engineering, home economics, pharmacy and nursing education, and general science. Courses lead to bachelor and master of science degrees. The school was founded in 1884, and has an average enrollment of about 1,300. G.L.B.R.

**SOUTH DAKOTA STATE SCHOOL OF MINES AND TECHNOLOGY** is a state-supported coeducational school at Rapid City, S.D. It is attended chiefly by men. The school offers courses in chemical, civil, electrical, general, geological, mechanical, metallurgical, and mining engineering, and in physics and chemistry. Courses lead to degrees of bachelor and master of science, and chemical engineering degrees. The school was founded in 1885 and has an average enrollment of about 400.

**SOUTHDOWN**. See SHEEP (Breeds of Domestic Sheep).

**SOUTHEAST MISSOURI STATE COLLEGE**. See MISSOURI STATE COLLEGE.

**SOUTH EQUATORIAL CURRENT**. See OCEAN CURRENTS.

**SOUTHERN CALIFORNIA, UNIVERSITY OF**, is a privately controlled coeducational school at University Park, in Los Angeles. Among the twenty-five separate schools and colleges are those of medicine, law, engineering, dentistry, religion, pharmacy, commerce, social work, architecture and fine arts, public administration, library science, nursing, journalism, music, speech, international relations, and education.

University College is the evening division of the school. It provides academic credit for students employed during the daytime. The Civic Center division of the School of Public Administration offers courses of

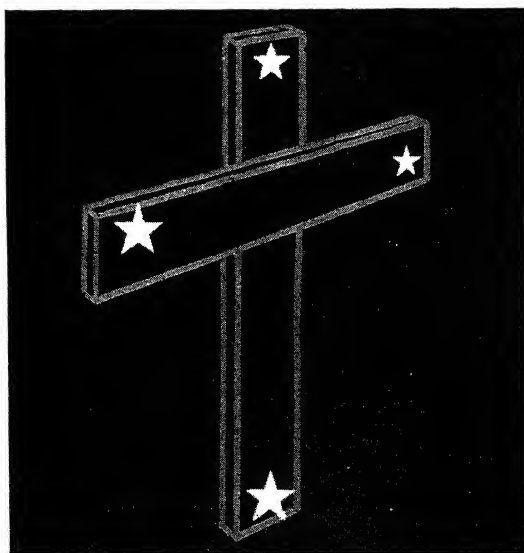
study in the various departments of the city government of Los Angeles. Southern California also controls the University of International Relations. This institution is especially well known for preparing students for the diplomatic services.

The University offers all the usual undergraduate and graduate liberal arts and technological degrees. Students live in dormitories and in chapter houses of national sororities and fraternities. About 45 per cent of the students do part-time work while attending the university. The campus is near Exposition Park, which contains museums and art galleries.

The university was founded in 1880 by the Southern California Conference of the Methodist Episcopal Church. The church is still represented on the school's board of trustees, but the university is open to students of all faiths. The average annual enrollment is about 12,000.

F.B.Sk.

**SOUTHERN CROSS.** The Southern Cross is a famous constellation, or group of stars, in the Southern Hemisphere. It is also called the *Crux*, which is Latin for *cross*. The constellation gets its name from the outline of a cross formed by its four brightest stars. The star



**The Constellation of the Southern Cross** is in the Southern Hemisphere, and cannot be seen from the United States. This constellation was a guidepost to early navigators who sailed in distant southern seas.

farthest to the south is a star of the first magnitude. The eastern and northern stars are of the second magnitude, and the western star is of the third magnitude. The four stars are not arranged in the exact form of a cross, and the constellation is sometimes difficult to pick out among the stars if one has not seen it before. The upper and lower stars, which form the "upright" of the cross, point to the South Pole of the sky, much as the last two stars of the big dipper point to the North Star in the Northern Hemisphere.

C.F.

**SOUTHERN EDUCATION FOUNDATION.** This organization works to improve the educational conditions of Negroes in the southern United States. The Foundation

was formed in 1937 from the funds of George Peabody, John F. Slater, and Anna T. Jeanes. In 1938 the Virginia Randolph fund was added. A board of directors controls the Foundation and co-operates with school officials to help pay the salaries of Negro teachers in the fourteen southern states. In 1946 the Foundation aided in the support of about 475 teachers in rural schools. See also JEANES FOUNDATION; PEABODY EDUCATION FUND; SLATER FUND.

**SOUTHERN HEMISPHERE.** See HEMISPHERE.

**SOUTHERN ILLINOIS NORMAL UNIVERSITY** is a state-supported coeducational school at Carbondale, Ill. Its colleges of education, liberal arts and sciences, and vocations and professions offer courses leading to bachelors' and masters' degrees. Student residences include a dormitory for women, co-operative houses, sorority and fraternity houses, approved rooming houses, and private homes. The university was founded in 1874, and has an average enrollment of about 2,000.

**SOUTHERN METHODIST UNIVERSITY** is a coeducational school in Dallas, Tex. It is controlled by the Methodist Church. The university has a college of arts and sciences, schools of business administration, engineering, law, music, and theology, and a graduate school. Dallas College is an extension division. Courses lead to bachelors' and masters' degrees. The school was chartered in 1911, and opened in 1915. Average enrollment is about 2,000.

R.C.KN.

**SOUTHERN OREGON COLLEGE OF EDUCATION** is a state-supported coeducational school at Ashland, Ore. It offers training in elementary teacher education, secretarial science, merchandising, and medical and dental assistants' work. The school was established in 1926. Average enrollment is about 300.

W.REB.

**SOUTHERN UNIVERSITY AND AGRICULTURAL AND MECHANICAL COLLEGE** is a state-supported coeducational school for Negroes at Baton Rouge, La. Courses are offered in liberal arts, agriculture, mechanic arts, home economics, music, health and physical education, and education. The school was founded in 1914 and has an average enrollment of about 1,200.

F.G.C.

**SOUTHEY, SOUTH ih, or SUTH ih, ROBERT** (1774-1843), was an English poet and prose writer. He was associated with William Wordsworth and Samuel Coleridge in the Lake school of English poetry. In 1813 Southey was appointed poet laureate, but most readers prefer his prose to his poetry.

Southey was born at Bristol. His parents died when he was young, and he spent most of his boyhood with an aunt at Bath. He was expelled from Westminster School for writing a satire on flogging. Later he attended Oxford University for two years.

After a trip to Portugal, Southey lived at Keswick in the Lake District, where he studied and wrote dili-



Brown Bros.

**Robert Southey** was one of England's greatest poets of the Romantic Age.



gently. In 1807 the government granted him a pension of £160 a year (about \$800), which was later increased to £300. Southey had been a radical in politics and religion early in his life. But as he grew older he became more conservative, and by the time he was appointed poet laureate, he was a strong Tory. L.U.

See also **BLenheim**, **Battle of**; **Coleridge**, **Samuel Taylor**; **Lake Poets**; **Poet Laureate**; **Wordsworth**, **William**.

**His Works** include the poems "Joan of Arc," "Thalaba, the Destroyer," and "Roderick, the Last of the Goths," all of which are narratives based on legends and myths; a *History of Brazil*; a drama, *Wat Tyler*; *The Doctor*; and biographies of Horatio Nelson, John Wesley, and John Bunyan.

**SOUTH GEORGIA.** See **FALKLAND ISLANDS** (Dependencies).

**SOUTH ISLAND.** See **NEW ZEALAND** (Location, Size, and Surface Features).

**SOUTH MAGNETIC POLE.** See **MAGNET AND MAGNETISM** (The Earth's Magnetism).

**SOUTH ORKNEY ISLANDS.** See **FALKLAND ISLANDS** (Dependencies).

**SOUTH PLATTE RIVER.** See **COLORADO** (Rivers and Lakes); **NORTH PLATTE**.

**SOUTH POLE.** The geographical South Pole is the southernmost point on the surface of the earth. It lies ninety degrees south of the equator. The South Pole is on the continent of Antarctica. Its position can be determined only by careful observations with scientific instruments. There is also a *magnetic* south pole, which is different from the geographical South Pole. The South Magnetic Pole is the south point toward which the needle of a compass points. It is near Sydney, Australia, 1,800 miles from the South Pole.

The south polar region is cold, barren, and ice-covered. No human beings live there, but there are some sea gulls, penguins, and seals, and many whales. In 1911 the Norwegian explorer Roald Amundsen was the first man to reach the South Pole. In 1934 and again in 1947 Admiral Richard E. Byrd headed expeditions to the polar regions to gather scientific data. W.E.E.

See also **AMUNDSEN**, **Roald**; **ANTARCTIC**; **POLAR EXPLORATION**.

**SOUTH SAN FRANCISCO COAST GUARD AIR STATION.** See **SAN FRANCISCO** (History).

**SOUTH SEA** is the name given to the Pacific Ocean by Vasco Núñez de Balboa, governor of Darien. Balboa first saw the vast sea while looking south from the top of a mountain in Central America. H.U.S.

**SOUTH SEA COMPANY.** See **WALPOLE**, **Robert**, **Sir**, **Earl of Oxford**.

**SOUTH SEA ISLANDS.** See **PACIFIC ISLANDS**.

**SOUTH SHETLAND ISLANDS.** See **FALKLAND ISLANDS** (Dependencies).

**SOUTH VICTORIA LAND.** See **VICTORIA LAND**.

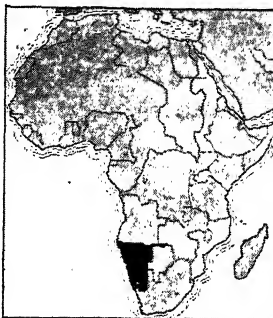
**SOUTH WEST AFRICA** is a territory administered by the Union of South Africa under a mandate from the League of Nations. This area was formerly known as German South West Africa. It lies between the Portuguese colony of Angola to the north and the Union of South Africa to the south. The eastern border is formed by the British territory of Bechuanaland Protectorate.

The total area of 317,725 square miles has an Atlantic Ocean coast line about 850 miles long.

**The Land and Its Resources.** South West Africa is a dry country. The only important rivers are the Cunene and the Orange, which form the northern and southern boundaries respectively. The coastal area is known as the *Namib* and is a true desert of sand dunes and stony land with little or no vegetation. This area averages about fifty miles wide. Except for the coastal towns, it is practically uninhabited and uninhabitable. Walvis Bay is the only important harbor.

Inland from the Namib is the region of *Great Namaqualand*. This is a higher region which has more rain

and is covered with poor grass and scrub vegetation. Underground water is available in places. The northern part of this region averages a mile above sea level and has sufficient rainfall to support grasses suitable for cattle and wild game, such as gazelle and buck. Here are located cattle ranches, some farms, and most of the European inhabitants of



Location of South West Africa

the country. Here also is the capital city of Windhoek (population 18,939).

The third region is the *Kalahari* which takes up the north and the east of South West Africa. It is a dry land of rough bushes, coarse grass, and thorn trees where dry farming and the raising of livestock are possible in some places.

South West Africa has important mineral deposits. Copper is widely distributed and is found in deposits with other valuable metals such as lead, zinc, vanadium, and silver. Diamonds are found in the stream gravel of



Shalek, Three Lions

**Natives of South West Africa** in front of their dome-shaped hut. The flimsy dwelling is built of scrap metal and has a paper-and cloth-covered roof. Rocks and a long stick hold the roof in place when wind whips across the sandy plains.

the Orange River and along the coast. But the high costs of mining and transportation have limited the development of all mineral deposits.

**The People and Their Work.** South West Africa has an estimated population of 347,442, including 30,677 Europeans. Many different peoples make up the native population. Typical inhabitants of the Kalahari region are the Bushmen. Namaqualand is the home of the Hottentots. There also are the Ovambos, who are farmers and metalworkers, and the Hereros, who were warlike cattle-raising nomads and the rulers of most of the territory at the time the first Europeans arrived. An important group are the Rehoboths who have mixed native and European blood. All these native peoples make a living by farming or cattle raising, or live by the meager returns of furnishing labor to the mines, railroads, and European settlers.

**History and Government.** In 1883 a German trading company secured a concession on the coast at Lüderitz and by 1892 the German government possessed the entire country. There were many native revolts, led by the Herero tribe, but they were put down by the new rulers. After the outbreak of World War I, troops from the Union of South Africa invaded South West Africa and conquered the German forces. The mandate from the League of Nations gave the administration of South West Africa to the Union. The German settlers have been very little disturbed.

H.V.B.K., JR.

See also UNION OF SOUTH AFRICA (map); WINDHOEK.

**SOUTHWESTERN AT MEMPHIS** is a coeducational liberal arts school in Memphis, Tenn. It is controlled by the Presbyterian Church, and has a tutorial plan of individual instruction. Courses offered lead to B.A., B.S., and B.Mus. degrees. The school was established in 1848, and has an average enrollment of about 500.

C.E.DIE.

**SOUTHWESTERN COLLEGE** is a coeducational liberal arts school at Winfield, Kan. It is controlled by the Southwest Kansas Conference of the Methodist Church. Courses offered lead to B.A. and B.Mus. degrees. The school was opened in 1886. Average enrollment is about 600.

V.M.S.

**SOUTHWESTERN LOUISIANA INSTITUTE OF LIBERAL AND TECHNICAL LEARNING** is a state-controlled coeducational college at Lafayette, La. It has colleges of liberal arts, education, agriculture, and engineering. Courses lead to B.A. and B.S. degrees. The school was opened in 1901 and received its present name in 1921. Average enrollment is about 2,500.

J.L.F.

**SOUTHWESTERN UNIVERSITY** is a coeducational liberal arts school at Georgetown, Tex. It is controlled by the Methodist Church. It has a college of arts and sciences and a school of fine arts. Weatherford Junior College at Weatherford, Tex., and the Westminster Junior College at Tehuacana, Tex., are connected with the university. The school was chartered by the Republic of Texas in 1840 and opened in 1873. Average enrollment is about 1,100.

J.N.R.S.

**SOUTHWEST MISSOURI STATE COLLEGE.** See MISSOURI STATE COLLEGE.

**SOVEREIGN, SAHV er in, or SAHV rin.** See POUND STERLING.

**SOVEREIGNTY.** The name "sovereign" was first applied to kings. Everyone in a kingdom, including the

greatest dukes, counts, or earls, was a subject of the king. The king himself was usually *sovereign*, which means *subject to no one*.

There are few kings left in the world, but the idea of sovereignty remains. Today many countries are considered *subject to no one*, and therefore *sovereign*. A sovereign country can conduct its own affairs, enter into treaties, declare war, or adopt any other course of action without the consent of any other country. Small countries are often sovereign in name only. They can be safe and prosperous only as they shape their policies to suit the desires or needs of a stronger country.

The United States of America is a sovereign nation, but the forty-eight states which compose it do not have full sovereignty. See STATE.

P.S.W., JR.

**SOVIET, soh vih ET, or SO vih el,** is a Russian word which means *council*. Russian revolutionary groups were known as *soviets*. They were formed throughout Russia after the downfall of the czar in March, 1917. The *soviets* were councils of workingmen, peasants, and soldiers. These councils rallied the Russian people to the support of the Bolshevik political programs, and approved the Bolshevik plan for setting up a Soviet government. Since 1924 Russia has been officially known as the Union of Soviet Socialist Republics. In 1946 the Soviet government announced that henceforth the army and navy would be officially known as the Soviet Army and Soviet Navy. Until the time of the announcement, the army and navy had sometimes been referred to as the Red Army and Red Navy.

W.H.CHA.

**SOVIET TURKESTAN.** See TURKESTAN; TURKMEN SOVIET SOCIALIST REPUBLIC.

**SOVIET UNION.** See UNION OF SOVIET SOCIALIST REPUBLICS.

**SOW.** See HOG.

**SOW, sou, BUG** is a common name for the wood louse, a small bug with seven pairs of legs and a flattened body. It lives under stones, under bark on trees, and in crevices.

**SOWING, SO ing, MACHINE, or SEEDER.** See DRILL, OR SEEDER.

**SOW, sou, THISTLE** is the name of a group of weeds in the composite family. These weeds grow wild in Europe, and several species have been introduced into the United States, where they have become a nuisance. One of the best known is the *common sow thistle*, which grows two or three feet high and has a branching stem. Its juice is milky and its flowers bear small yellow blossoms. Another is the *perennial sow thistle*, one of the most troublesome weeds.

W.C.M.



U.S.D.A.

**Classification.** Sow thistles make up the genus *Sonchus* in the *Compositae* family. The common weed is *S. oleraceus*.

**Flowers and Prickly Leaves** of the sow thistle

**SOY.** See RICE (Food Value).

**SOYBEAN.** The soybean is a plant related to the peas and beans. It belongs to the plant family called legumes. The soybean first grew in the Orient. For hundreds of years Oriental peoples have fed it to their animals and have eaten it themselves, almost as we eat meat. The soybean was first grown in the United States as food for farm animals. But today it gives us many products for industrial uses as well as foods for the family table and for farm animals.

The soybean is rich in food values. It has more protein than beef, more calcium than milk, and more of a chemical called lecithin than eggs. It is about as rich as any other food in vitamins, mineral salts, and acids. The soybean is not fattening and is easily digested because it has very little starch. Today it is as important as corn and wheat. The soybean is known as the "wonder" crop, the "magic plant," and the "wonder bean." In China it is called the "little honorable plant." In the Soviet Union it is called the "little Soviet ally."

### Uses of the Soybean

**The Plant** is used widely as hay, silage (winter food for stock), and pasturage (green food for stock). It compares favorably with other leguminous plants used as forage, such as alfalfa and the clovers.

**The Bean** has long been the chief source of health and energy for the Orientals. The soybean gives them many of the food values that we get from meat and milk. During World War II the food shortage brought the soybean to many tables in the Western world. Our breakfast cereal may be made of soybeans. Our soy flour bread may be buttered with soy margarine. We can fry our eggs in soy oils and bake our cakes with soy shortening. And diners often sprinkle soy sauce generously over their chop suey.

In the manufacturing field, the soybean was used in place of scarce materials, and was often found to be better than the scarce material. Both the green bean and the dried bean have their uses. And the bean itself can be divided into two valuable by-products, oil and meal.

The great value of the soybean has not always been known. One of the pioneers in soybean study was the great Negro scientist, George Washington Carver. Among the products of his many discoveries were soybean flour and breakfast cereal, soy oils, and substitutes for milk and coffee. His work was the basis for further experiments in private laboratories and in laboratories of the United States Department of Agriculture.

### Description and Varieties

The soybean is derived from a wild plant of eastern Asia. As it grows, it branches out in all directions and produces thick leaves. The plant grows to two to three-and-a-half or more feet high. The stems, leaves, and pods are covered with short, fine, brown or gray hairs. Small white or purple flowers appear where the leaf joins the stem. The bean pods range in color from very light yellow to shades of gray, brown, and black. Each contains from two to four round or oval seeds. The seeds themselves may be colored in shades of yellow, green, brown, black, or may be speckled.

More than 2,500 kinds or varieties of soybeans have been introduced into the United States from the Orient.

Almost all of the important commercial varieties have been developed from these imported types. Only a few important new varieties have been produced by hybridization (crossing the known plants). In time, experiments with hybridization may bring forth valuable results. The characteristics of both plant and bean vary with the soil, methods of cultivation, seasonal conditions, and locality.

Each variety of plant is better for some uses than for others. Thus, the farmer first decides what his crop is to be used for. Then he plants the variety that will best suit his wants.

The yellow-seeded varieties have the most oil. When the oil has been pressed out, the meal that is left can be used in foods and other products. Usually the varieties that are used for grain production are fine for stock feed. Most soybeans now grown for grain have a strong, unpleasant taste, although they are edible and have high food values. Farmers in certain areas grow small seeded, fine stemmed, trailing varieties for hay and green manure.

Among the newer varieties are a group which are excellent as green and as dry shelled beans for human food. They cook easily and have an attractive green color when prepared like green Lima beans.

### Culture

Soybeans grow best in areas where corn grows best. They need almost the same soil, fertility, and climate. A well-drained, warm, fertile loam soil is excellent for soybeans. Reasonably good crops can be grown on drained swamplands and muck soils. Soils of low fertility can be used if they are limed, fertilized, and inoculated. Soybeans should always be grown where the soil contains the nitrogen-fixing organism which can produce nodules on the plant's roots. Without this organism, the nitrogen-fixing benefit of the legume will not be realized.

The soybean can be planted either separately like corn or in solid rows like the small grains. Whichever method is used, weeds should be controlled with a rotary hoe, spike-tooth harrow, or heavy weeder.

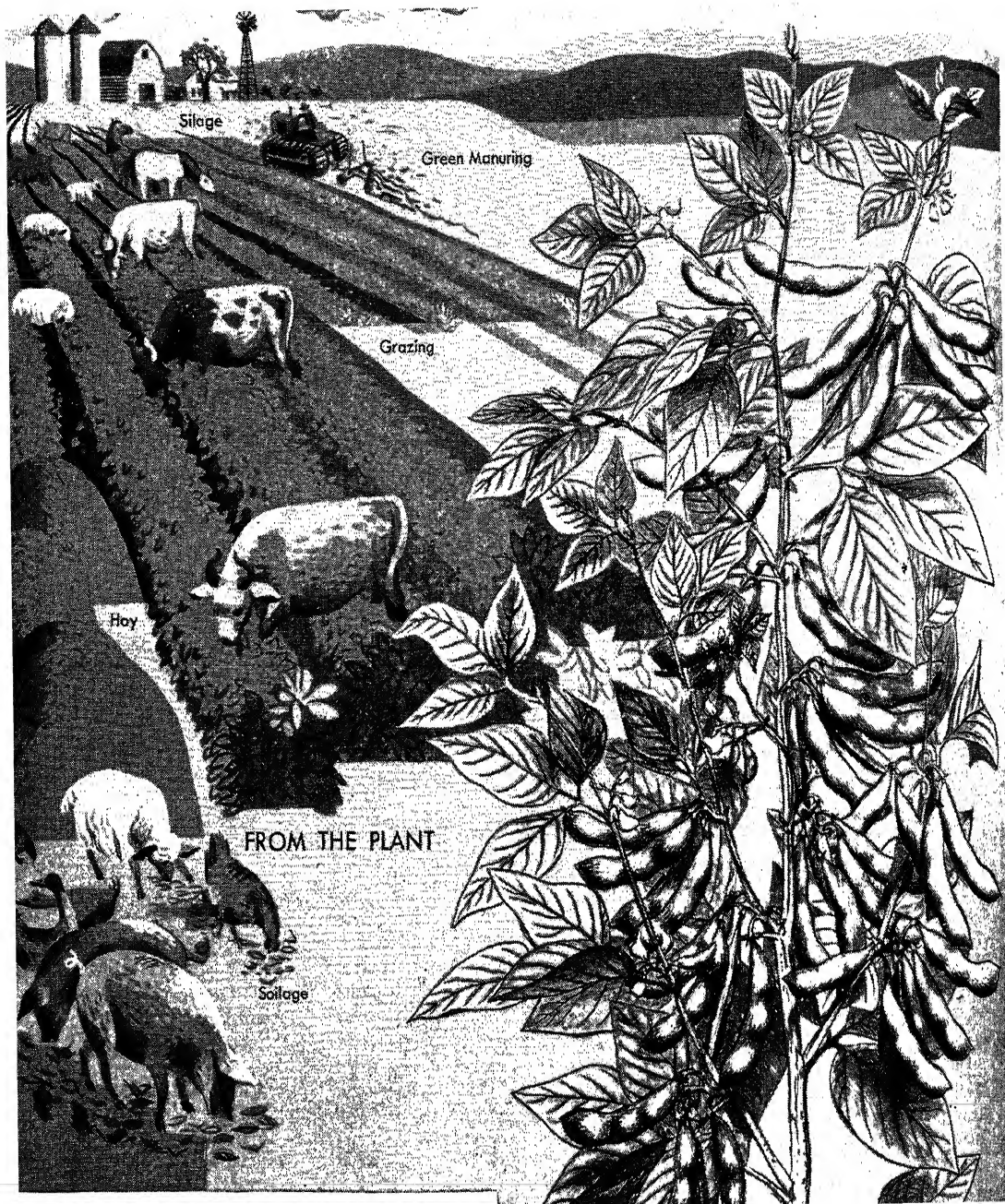
The soybean has few enemies in the United States, although in the Orient it is attacked by serious plant diseases. Some fungus, bacterial, and virus diseases exist in the United States. Among the insect enemies are grasshoppers, blister beetles, leaf hoppers, the green clover worm, and the velvet-bean caterpillar. However, these insects seldom spoil a crop. Among the animal enemies, woodchucks and rabbits can cause serious damage, especially to a small planting.

### Development of the Soybean

The soybean is one of the oldest crops grown by man. In 2838 B.C. the Emperor Shung Nung of China wrote a description of the soybean plant. This is said to be the earliest record of the plant. The ancient Chinese considered the soybean their most important crop, and one of the five sacred grains necessary for living.

By the 1600's soybeans were known in Europe and had been tried in Germany, England, France, and Hungary. But the crop was not large in any part of Europe until recent years.

It was not until 1804 that the soybean found its way

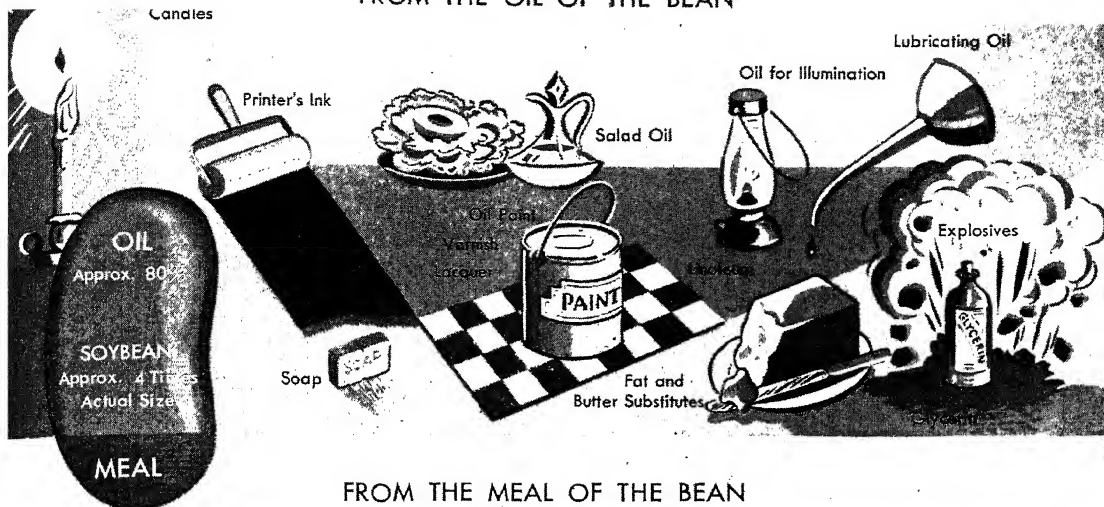


## WHAT WE GET FROM SOYBEANS

First introduced into the United States in 1804, the soybean was not cultivated extensively until after World War I. Today it is grown throughout the corn belt. The *plant* is used as hay, silage, and fodder for livestock. The *bean* is especially rich in proteins, fatty oils, mineral content, and vitamins. From the *meal* of the bean such products as plastics, stock feeds, human foods, and glue are made. Butter and rubber substitutes, candies, soaps, and varnishes are among the products made from the *oil* of the bean. From the *green* and *dried bean*, breakfast foods, flour, ice-cream powder, baked beans, and meat and coffee substitutes are made. In addition, the *roots* of the plant help to restore soils that may be deficient in nitrogen.



FROM THE OIL OF THE DEAN





into American records. At that time James Mease wrote, "The soybean is adapted to Pennsylvania and should be cultivated." In 1854 the Perry expedition to Japan brought back two varieties, known then as "Japan pea," "Japan bean," and "Japan fodder plant." More varieties and seeds were brought across the Pacific in 1889 and 1890. Eight more years passed before the United States Department of Agriculture began to introduce many varieties and types and thus boosted the commercial growth of the soybean. Up to that time there were probably not more than eight varieties of soybeans grown in this country. Pioneers in soybean development included Charles Vancouver Piper and W. J. Morse, both of the Department of Agriculture.

More than a hundred varieties of the soybean plant are now cultivated in the United States, and new types are continually being developed. In 1939 the country produced 90,000,000 bushels of soybeans. In 1944 the output was more than twice that much. The greatest acreage and total production are found in the Middle West, in the so-called Corn Belt.

China always leads in world production of the soy-

feed, or industrial uses in many other regions. include the Philippines, Siam, Cochin-China, India, the East Indies, the Soviet Union, Czechoslovakia, Rumania, Germany, England, South Africa, British East Africa, Algeria, Egypt, New South Wales, New Zealand, and Ontario.

See also BEAN; CHEMURGY; PLANT (color plate, Vegetables Unknown to Our Forefathers).

#### Questions

What is the soybean sometimes called in the United States? In China?

What food values does the soybean contain?

In what forms do American people often eat soybeans?

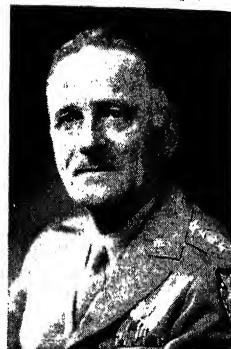
How many kinds of soybeans have been introduced into the United States? Which varieties yield the most oil?

What country leads the world in the production of soybeans? What other countries are important in soybean growing?

**SPA.** See BATHS AND BATHING; MINERAL WATER.

**SPAATZ**, *spahts*, **CARL** (1891- ), was a leading United States Army Air Force commander of World War II. From 1944 until Germany surrendered he commanded the Allied bombing forces in Europe, and from July, 1945, until Japan surrendered he directed the United States Strategic Bombing Force in the Pacific.

Spaatz was born at Boyertown, Pa., and was graduated from the United States Military Academy in 1914. He completed his aviation training in 1916 and was a member of a pursuit squadron in France in World War I. After the war he took part in a number of air-force experimental flights. In 1929 he commanded a plane which made a record endurance flight of 150 hours, forty minutes, and fifteen seconds. In July, 1941, General Spaatz became chief of the army air staff. He went to Europe in the summer of 1942 and directed air operations in North Africa and Sicily. After the war, he was appointed commander in chief of the Army Air Force. He retired from this post in 1948.



U.S. Signal Corps

**Carl Spaatz** helped plan the destruction of Germany by air in World War II.

**SPACE TIME.** See GRAVITATION.

**SPADEFISH.** See ANGELFISH.

**SPADIX**, *SPA dicks*. See ARUM; INFLORESCENCE.

**SPAETH**, *spayth*, **SIGMUND** (1885- ), is an American author of popular books on music appreciation.

Spaeth was born in Philadelphia, and began to study violin and piano at the age of twelve. He attended Haverford College and received his Ph.D. degree from Princeton University. For two years he taught at Asheville, N.C. He then went to New York City, where he reviewed musical events for the *Evening Mail* and the *Times*.

His Works include *The Common Sense of Music*; *Words and Music*; *Great Symphonies*; and *Music for Fun*.

**SPAGHETTI**, *spah GET ih*. See MACARONI.

## Ten Leading Soybean States

Illinois

Iowa

Indiana

Ohio

Missouri

N. Carolina

Minnesota

Mississippi

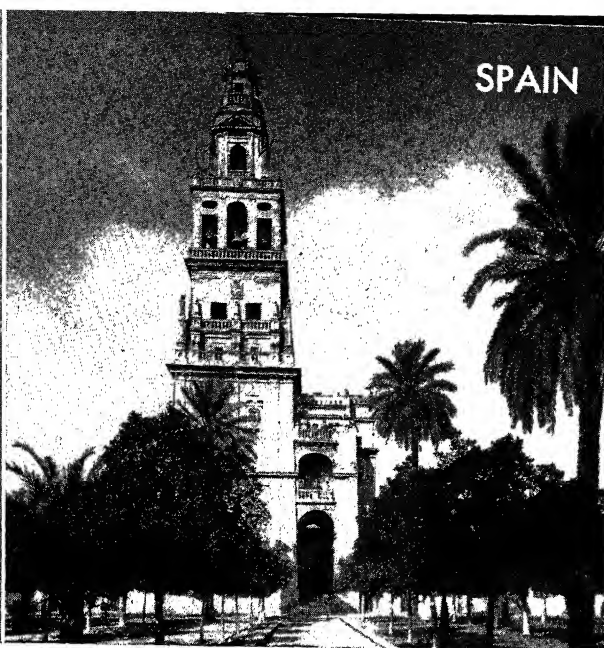
Michigan

Kansas

Each symbol stands for  
5,000,000 bushels of Soybean  
Based on Government Statistics for a 4-year period

PICTOGRAPH CORPORATION

bean. Other leading soybean growers are Manchuria, Korea, Japan, and the Netherlands Indies. The crop either has been tried or is now being grown for food,



Ewing Galloway; Gendreau

**SPAIN** (in Spanish, *ESPAÑA*) is an old and colorful country in southwestern Europe. Spain is rich in romantic traditions. Its civilization is a mixture of ancient customs, the grandeur of the Middle Ages, and the culture of modern Europe. Four hundred years ago Spain was the most powerful country in the world. Today Spain is no longer a great power, but its cities and castles still tell of its vanished glories.

Spain has been the home of many peoples. Barcelona was once a port of ancient Carthage, and the Spanish city of Cartagena was named for that nation. The Spanish peninsula was once a Carthaginian colony, but the Romans seized it from Carthage. It became one of the richest provinces of the Roman Empire, and then was conquered by the fierce Germanic tribes. Hundreds of years later Moorish invaders from Africa overran Spain. During the Middle Ages Spain was the center of the brilliant Moorish civilization.

All these races have left their mark upon modern Spain. The Spanish language is based on the Latin spoken by ancient Romans. The palaces which the Moors built in Spain are among the most beautiful buildings in the world. Spanish life is different in many ways from life in the other countries of Europe. The towering Pyrenees Mountains have always cut Spain off from the rest of Europe and made it a nation apart. There is a saying that "Africa begins at the Pyrenees."

There are wide differences between the various regions of Spain. *Castile* lies in central Spain, and the people there speak the Spanish that we learn in school. The people of *Catalonia*, in eastern Spain, speak a language greatly different from Castilian Spanish. The Moorish influence is still strong in the south. The mysterious Basque people live along the northern coast, and speak a language all their own. Spanish ways of life differ as much as Spanish languages.

Spain has made great contributions to the history of the world. Christopher Columbus was an Italian from Genoa, but he sailed to America in Spanish ships under a Spanish flag. Spanish navigators braved the unknown

waters of the New World. Spanish explorers went deep into Central and South America. Vasco Núñez de Balboa was the first white man to reach the Pacific, and Hernando de Soto discovered the Mississippi River.

#### The Land and Its Resources

**Extent:** *Area*, including the Balearic and Canary Islands, 195,504 square miles. *Greatest length* (north to south), 538 miles; *greatest width* (east to west), 668.5 miles. *Coast line*, 1,400 miles.

**Physical Features:** *Chief mountain ranges*, Pyrenees, Cantabrians, Sierra de Gato, Sierra de Gredos, Sierra de Guadarrama, Sierra Nevada. *Chief peaks*, Mulhacén (11,417 feet), Maladetta (11,165 feet), Pico de Anato (11,167 feet), Pico Carredo (8,794 feet). *Chief rivers*, Ebro, Guadalquivir, Guadiana, Tagus, Douro. *Chief islands*, Balearics, Canaries. *Chief bays and gulfs*, Bay of Biscay, Gulf of Cadiz.

**Location, Size, and Surface Features.** Continental Spain covers an area of 189,890 square miles. This is about twice the size of the state of Oregon. Spain takes up most of the Iberian Peninsula, where Portugal also lies. At its southernmost point, the peninsula is less than fifteen miles from the mainland of Africa.

The northwestern provinces of Spain border on the Atlantic. But Portugal cuts off most of western Spain from the ocean. Spain's eastern coast is on the Mediterranean, with France to the northeast. The British fortress of Gibraltar stands at the extreme south of the country, at the end of a long isthmus known as the *Neutral Ground*. For the boundaries of Spain, see the colored map.

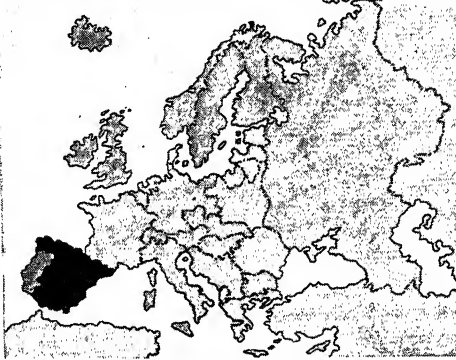
**Coast Line.** The Spanish coast line is fairly straight

#### Pronunciation Guide

Cantabrian	Guadiana <i>GWAH thee AH nah</i>
can <i>TA brih an</i>	Junta de Defensa Nacional
Douro <i>DOH roo</i>	<i>HOON tah duh day FAYNS</i>
El Caudillo	<i>ah nath yoh NAL</i>
kou <i>THEEL yoh</i>	Mulhacén <i>MOOL ah THAYN</i>
Generalife	Penas de Europa <i>PAY nyahs</i>
<i>GEN er al EEF</i>	<i>duh you ROHP ah</i>

and not deeply cut by bays or gulfs. Spain has few natural harbors, except in the northwest. Many of the bays and river mouths are filled with sand.

**Natural Regions.** The forbidding Pyrenees Mountains form the land boundary with France. There are only two good passes along the entire length of the range.



Location of Spain Is Shown in Black

One is at the western end of the Pyrenees, where the city of San Sebastian stands. The other pass is a high saddle over the mountains near the eastern end of the range. The great Carthaginian general Hannibal (247-183 B.C.) marched his armies and his elephants through this pass on their way into Italy. A railway between Barcelona and Toulouse, France, now runs through this pass.

Another railroad runs around the Pyrenees where they end on the Mediterranean coast, but it does so only with considerable difficulty. The boundary between France and Spain follows the main crestline of the mountains. In this way the boundary puts the headwaters of the French Garonne River in Spain, and puts the headwaters of the Spanish Segre River in France. The Spanish village of Llívia was left north of the boundary by mistake and is entirely surrounded by France.

Three fourths of Spain is a treeless tableland 1,000 to 3,000 feet above the sea. It is enclosed by lofty mountains and broken by high rocky hills. Spain has three lines of mountains. The Cantabrians and Pyrenees lie along the north. The second chain of mountains runs west to east through central Spain. The lofty Sierra Nevada rise in the south and form a part of the third mountain chain. The Sierra Nevada range continues out into the Mediterranean and forms the Balearic Islands.

The mountains, plateaus, and plains make separate regions which are often mentioned in literature. The *Basque Provinces* are in the eastern Cantabrians, along the northern coast. This is a remote and mountainous country, green with forests and far different from the yellow brown plains of Castile.

*Galicia* is in northwestern Spain. The Galician landscape looks much like parts of *Eire*. Galicia is a region of cattle raisers and fishermen. Famous *Old Castile* lies north of the central mountain ranges. *New Castile* is just to the south of the central ranges. The *Asturias* region is in the central Cantabrian Mountains. Southern Spain is often called *Andalusia*.

**Rivers and Lakes.** Four of the great rivers of Spain rise in the central tableland and empty into the Atlantic. The Tagus and the Douro flow west through Portugal. The Guadiana follows a southerly course along the Portuguese border to the Atlantic. The Guadalquivir passes south through the olive country of Andalusia on its way to the ocean. It is the deepest river in Spain, and the only one on which large vessels can sail. The Ebro rises in the Cantabrian Mountains and flows east to the Mediterranean. The Ebro is the largest river on the Mediterranean side.

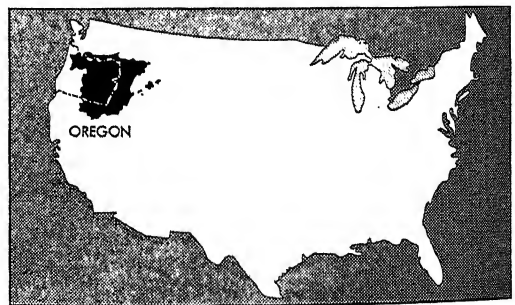
The word *Guad* appears in the names of a number of Spanish rivers. It comes from an Arabic word which means a stream that dries up in the summer. Some people say that the rivers of southern Spain have long names and little water. The Guadalquivir is the deepest river, but it is navigable only as far inland as Seville.

There are a number of small mountain lakes, and many salt ponds in the barren steppes. The only large bodies of water in Spain are three coastal lakes, or lagoons. The Laguna de la Janda is near Cádiz. The Albufera is near Valencia, and the Mar Menor is not far from Murcia.

**Climate.** Spain has every climate of the Temperate Zone. Galicia, the Asturias, and the Basque Provinces have a marine climate. Their winters are damp, cold, and bleak, with great storms and much cloudy weather. The summers are cool, and an ample rainfall keeps the valleys green. This northern coast is a forest and cattle country, with about sixty inches of rainfall a year.

The inland climate of the tableland is not pleasant. No other part of Europe has greater extremes of temperature than occur here. This is caused largely by the height of the central plain, which is between 2,000 and 6,000 feet above sea level. In the winter there is considerable rainfall, and wheat is raised. In the summer the sun is too brilliant, and the plains are hot and dusty.

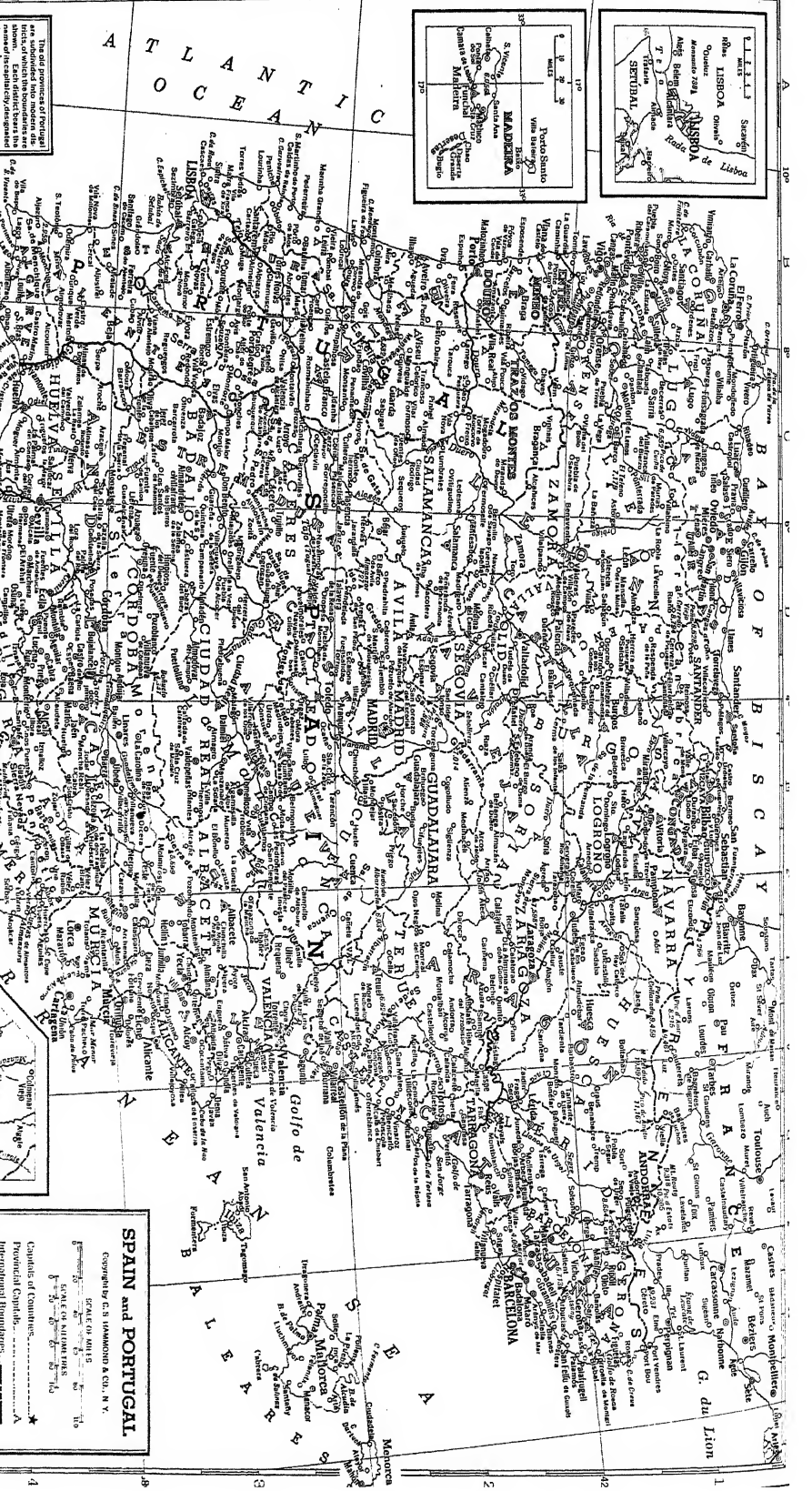
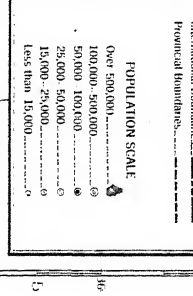
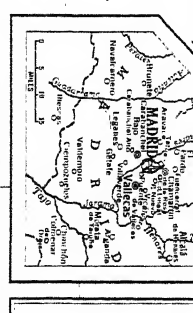
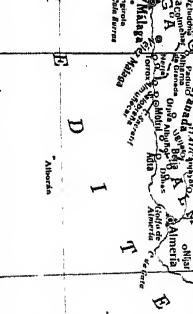
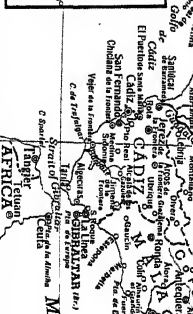
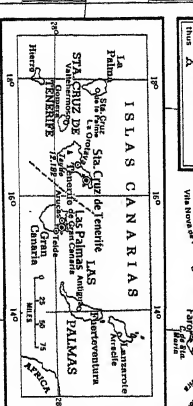
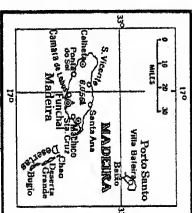
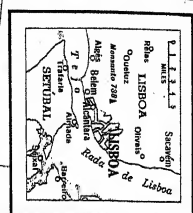
The southern and eastern coasts have a Mediterranean climate. The winters are mild, with a light rainfall. The dry steppes and plains of this region are the warmest sections of the country. They are frequently swept by the *solano*, a withering and scorching wind which may blow for two weeks at a time. Even sugar cane and date palms will grow in this hot climate. But



Area of Spain Compared with That of the United States

irrigation is necessary, because the rainfall is rarely more than fourteen inches a year.

**Natural Resources.** The soil of Spain is its greatest natural resource. Spanish people have made great efforts to care for the soil. Irrigation is widely used, and has



**SPAIN and PORTUGAL.**

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SCALE IN MILES

POPULATION SCALE

Over 500,000

100,000-500,000

50,000-100,000

25,000-50,000

15,000-25,000

Less than 15,000

Capital of Country

Provincial Capitals

International Boundaries

Potential Boundaries

# SPAIN AND PORTUGAL

## PORTUGAL

Alcántara, 34,903.....	A 1
Alges.....	A 1
Almada, 10,948.....	A 1
Aveiro, 15,349.....	B 2
Barreiro, 19,846.....	B 3
Beja, 14,501.....	C 4
Belém, 17,602.....	A 1
Braga, 30,201.....	B 2
Bragança, 6,977.....	C 2
Bugio (island).....	B 2
Calheta, 5,067.....	A 2
Câmara de Lobos, 11,692.....	A 2
Castelo Branco, 12,727.....	C 3
Chao (island).....	B 2
Coimbra, 29,055.....	B 2
Covilhã, 19,213.....	C 2
Deserta Grande (island).....	B 2
Desertas (islands).....	B 2
Elvas, 14,615.....	C 3
Évora, 27,038.....	C 3
Faro, 20,419.....	B 4
Funchal, 39,558.....	A 2
Guarda, 9,766.....	C 2
Ilhavo, 11,896.....	B 2
Leiria, 7,208.....	B 3
Lisboa (Lisbon, capital), 702,409.....	B 3
Loulé, 19,807.....	B 4
Machico, 10,820.....	A 2
Madeira (island), 247,071.....	A 2
Olhão, 13,627.....	C 4
Olivaes, 18,042.....	A 1
Ovar, 12,635.....	B 2
Portalegre, 12,046.....	C 3
Porto (Oporto), 261,816.....	B 2
Porto Santo (island), 2,701.....	A 2
Porto Santo (Villa Baleira).....	A 2
Póvoa de Varzim, 14,441.....	B 2
Queluz (de Cima), 4,921.....	A 1
Sacavém, 4,870.....	A 1
Santarém, 14,409.....	B 3
Seixal, 3,911.....	A 1
Setúbal, 45,583.....	B 3
Sintra, 11,759.....	B 3
Tavira, 12,364.....	C 4
Tórrres Novas, 11,633.....	B 3
Trafaria, 3,560.....	A 1
Viana do Castelo, 13,984.....	B 2
Vila Real, 7,980.....	C 2
(Villa Baleira), Porto Santo.....	A 2
Viseu, 13,003.....	C 2

## SPAIN

Adra, 12,611.....	E 4
Aguilar, 16,207.....	D 4
Agullas, 15,466.....	F 4
Albacete, 60,038.....	F 3
Albox, 10,552.....	E 4
Alcalá de Guadaira, 20,355.....	D 4
Alcalá de Henares, 14,971.....	G 4
Alcalá la Real, 26,172.....	E 4
Alcaudete, 18,678.....	E 4
Alcázar, 25,326.....	E 3
Alcira, 24,665.....	F 3
Alcoy, 44,124.....	F 3
Algeciras, 26,114.....	D 4
Alhama, 11,083.....	F 4
Alhaurín el Grande, 10,853.....	D 4
Alicante, 89,198.....	F 3
Allariz, 9,894.....	C 1
Aller, 25,001.....	D 1
Almadén, 13,168.....	D 3
Almandralejo, 19,570.....	C 3
Almansa, 16,620.....	F 3
Almería, 73,097.....	E 4
Almodóvar, 13,330.....	D 3
Aloia, 14,468.....	D 4
Andujar, 24,747.....	D 3
Antequera, 38,530.....	D 4
Antigua, 1,684.....	B 4
Arahal, El, 13,512.....	D 4
Aranjuez, 21,536.....	E 2
Arcos, 18,698.....	D 4
Arganda, 5,411.....	G 4
Arrecife, 6,927.....	C 4
Aruca, 22,737.....	B 5
Avila, 18,547.....	D 2
Avilés, 18,766.....	C 1
Ayamonte, 12,408.....	C 4
Azuaga, 17,041.....	D 3

Badajoz, 51,734.....	C 3
Badalona, 48,520.....	H 2
Baena, 25,258.....	D 4
Baeza, 18,109.....	E 4
Baleares Is., 411,273.....	H 3
Barcelona, 1,077,671.....	H 2
Baza, 20,588.....	E 4
Beja, 12,580.....	D 2
Berja, 12,644.....	E 4
Bilbao, 192,351.....	E 1
Bujalance, 15,961.....	D 4
Burgos, 51,491.....	E 1
Burriana, 18,263.....	G 3
Cabeza del Buey, 12,156.....	D 3
Cabra, 20,381.....	D 4
Cabrera (island), 13.....	H 3
Cáceres, 29,030.....	C 3
Cádiz, 85,854.....	C 4
Calahorra, 13,590.....	E 1
Calatayud, 17,726.....	F 2
Campanario, 9,617.....	D 3
Canary Islands (Islas Canarias).....	B 5
Cangas, 22,865.....	C 1
Carabanchel Alto, 7,660.....	F 4
Carabanchel Bajo, 22,251.....	F 4
Caravaca, 20,550.....	E 3
Carballo, 19,001.....	B 1
Carcagente, 18,062.....	F 3
Carmona, 23,309.....	D 4
Carolina, La, 15,239.....	E 3
Carreño, 10,631.....	D 1
Cartagena, 115,468.....	F 4
Caspe, 9,844.....	G 2
Castellón, 43,517.....	G 3
Castro del Río, 17,542.....	D 4
Castro-Urdiales, 12,763.....	E 1
Cazalla, 10,468.....	D 4
Cazorla, 13,354.....	E 4
Chegin, 17,684.....	F 3
Chamartin, 64,879.....	G 4
Chaffada, 15,780.....	C 1
Chiclana, 17,184.....	C 4
Ciempozuelos, 5,300.....	F 4
Cieza, 23,866.....	F 3
Ciudadela, 10,633.....	H 2
Ciudad Real, 31,307.....	D 3
Ciudad Rodrigo, 11,021.....	C 2
Cofn, 17,599.....	D 4
Colmenar Viejo, 8,062.....	F 4
Constantina, 14,686.....	D 4
Córdoba, 135,674.....	D 4
Corduba, La, 98,834.....	B 1
Cuadillo, 11,122.....	C 1
Cuenca, 21,156.....	E 2
Cuevas, 10,264.....	F 4
Cullera, 15,299.....	F 3
Dallas, 11,976.....	E 4
Denia, 12,656.....	G 3
Don Benito, 21,495.....	C 3
Dos Hermanas, 18,919.....	D 4
Dragonera (island), 4.....	H 3
Ecija, 34,895.....	D 4
Éibar, 12,191.....	E 1
Elche, 46,496.....	F 3
Estepona, 12,176.....	D 4
Estrada, La, 30,859.....	B 1
Felanitx, 11,888.....	H 3
Ferrol, El, 54,199.....	B 1
Figueras, 15,404.....	H 1
Fonsagrada, 15,455.....	C 1
Formentera (island), 3,074.....	G 3
Fregenal, 10,951.....	C 3
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*Semi-Independent State*

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## GIBRALTAR

*British*

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greatly increased the products of the dry southern regions. The two most productive regions are in Valencia and Catalonia, where the land is carefully terraced, fertilized, and irrigated by a network of canals.

The tableland and mountains of central Spain have few trees. The finest forests are in the western Pyrenees and the Cantabrian mountains. The most valuable trees there are the cork oak and the splendid Spanish chestnut. Fine cork trees are also found in the southern mountains. Spain is one of the greatest sources of cork in the world. Spain and Portugal together produce three fourths of the world's cork supply.

Spain has large deposits of coal, wolframite (from which tungsten is taken), potash, and iron. The famous mercury mines of Almaden were the richest in the world until mercury was discovered in California. Other minerals found in Spain include copper, lead, salt, zinc, pyrites, lignite, manganese, cobalt, sulfate of soda, sulfur, and phosphorus.

### The People and Their Work

**Population:** 27,051,076. *Density,* 138.3 persons per square mile.

**Chief Products:** *Agricultural,* wheat, olives, grapes, raisins, oranges, onions, barley, oats, rye, livestock (especially sheep, pigs, and cattle). *Manufactures,* cotton goods, woolens, laces, linen, paper, wines, silk, glass, sugar. *Mineral,* coal, wolframite, lignite, potash, iron, lead, and mercury. *Fisheries,* sardines, tunny, cod.

**The People.** The two states of New York and Pennsylvania together have almost as many persons as Spain. But the average density of population in Spain is more than three times as great as that in the United States. The most thickly populated section is Vizcaya Province, in the north-central region. The density here is 622 persons per square mile.

Most of the Spanish people are farmers and agricultural workers. The Spanish farmers are poor, and the many who do not own small farms of their own must work on the large estates. Two cities, Madrid and Barcelona, have a population of over a million, but most of the Spanish people live on the land.

Spain was originally inhabited by the Iberians, an early European people. They were related to the Gauls of France and to the early Britons of the British Isles. These people mixed with the later invaders of Spain. Celts, Carthaginians, Romans, Teutons, and Moslem Moors all added to the stock of modern Spaniards. The Moorish strain is strongest in the south, and the Celtic and Teutonic strains are strongest in the north.

The Galicians of northwestern Spain most closely resemble the early Celts. Their ancestors were driven into this corner of the peninsula by the invaders, much as the early Welsh were driven into the mountains of Wales. The Galicians are like the Welsh and the Bretons of France. They are very different from the people of Central Spain.

The Basques have lived in north-central Spain since ancient times. Their home is in the eastern Cantabrian and western Pyrenees mountains. The origin of the Basques has long been a mystery. (See *BASQUE*.) They are a proud people who protest that they are not Spaniards but Basques. The Basques are the chief iron miners of Spain.

The Catalans live on the eastern coast, from the French border down to Alicante. They are more French than Spanish in both their customs and their languages, and they are not fond of the other people of Spain. The Catalans are hard-working and scorn the easygoing ways of the true Spaniard. At times the Catalans have tried to set up a separate government of their own.

The Castilians of central Spain are the people we most generally think of as the real Spaniards. Castile is the heart of Spain, and the seat of the Spanish government. In southern Spain, the Andalusians still show the Moorish influence, in both blood and customs. They are quite different from the Castilians, and from the other peoples of Spain. The Andalusians have the natural gaiety and quick temper we associate with southern people.

Southern Spain is a country of sunlit courtyards surrounded by picturesque balconies. Nearly every home has barred or latticed windows. The people in the south are usually of medium height and of dark complexion. The women are noted for their beauty, dignity, and grace. Many of the people of northern Spain are blond and fair.

**Agriculture.** Three fourths of the Spanish people make their living from the soil, but farming methods are generally crude. About nine tenths of the Spanish soil will grow crops, but almost a third of the country is uncultivated. The government devoted much attention to agriculture after World War I. Agricultural commissions and schools were set up, irrigation projects were begun, and new farming methods were introduced.

The Spanish republic broke up many of the great estates, which had rented land to the people at high rates. These estates were divided and sold to small farmers. Lands belonging to the Catholic Church and the aristocracy were distributed in this way. This program stopped when Spain came under the rule of the dictator, General Francisco Franco.

Farming in Spain varies with the climate. The meadows and pastures suitable for cattle raising lie in the Cantabrian region of northern Galicia and the Asturias. Old Castile lies just below the Cantabrians, and much wheat is grown in its low basin. New Castile, south of the Sierra de Guadarrama, is an excellent wheat country except for some dry sections, where the famous Merino sheep are raised.

The Ebro Valley was first irrigated by the Moors and has been very productive ever since. The southern plains of Andalusia have a fair amount of rain, although irrigation is also used there with great success. The rich Guadalquivir Valley, where the cities of Cordoba and Seville lie, has an excellent irrigation system. So has the plain of Vega, to the south of Granada.

The high plain of Estramadura, on the southwestern border, is a sheep-raising region. In Valencia and Catalonia all available land is used, and large crops of oranges, lemons, grapes, and other fruits are produced.

The streams coming down from the uplands furnish water for irrigation in Valencia and Murcia. This region has a garden type of agriculture. Vegetables, fruits, and rice are grown, and crop failures are almost unknown.

More than ten million acres of Spanish land are planted in wheat. This acreage almost equals the wheat

lands of France, and is greater than those of Italy. But the Spanish wheat yield is small. It is less than half of the French crop, and only two thirds of the Italian yield. This unsatisfactory production is partly due to poor farming methods.

Northern Spain has a fairly heavy yearly rainfall, and much corn is grown there. In other parts of the country the rainfall is often too slight for wheat growing, and barley is raised. Olives are grown everywhere south of the Cantabrians in places where the soil is too poor or the land too hilly for other crops. Spain produces the finest olives in the world.

Rye and oats are often grown in the mountain areas. Some rice is grown, chiefly in the lowlands of Valencia. In order of the amount produced, the grains grown are wheat, barley, oats, rye, and rice. Spanish agriculture shows the disadvantages of the climate. In northwestern Spain there is too much rain and not enough sunshine. In the rest of the country there is too much sunshine and not enough rain.

Spain's agriculture is concentrated along certain lines. About five million acres are given over to olive culture, and another four million to grapevines. Olive oil generally takes the place of butter in the Spanish diet. One eighth of the olives are eaten as green fruit. Olives, grapes, wine, oranges, and almonds make up half of the total exports of the country.

Hillsides which would be useless for any other crops are planted in cork trees, and produce a valuable export crop. *Esparto* grass is grown throughout southern Spain. Its fibers are woven into rope. Spain is famous for its onions and citrus fruit. Flax, hemp, and silk are other Spanish farm products. Almonds are grown in Spain and the Balearic Islands, and sweet chestnuts are grown in the Spanish mountains.

The donkey or mule makes a better farm animal than the horse in the dry, hot climate of Spain. Most owners of small farms use donkeys. Goats are the chief milk animals of the dry Mediterranean climate. In Andalusia the best pastures are given over to the raising of bulls for bullfighting.

Spanish farms have a low average yield per acre. This is the chief reason for the low standard of living in Spain. Great estates take up much of the land, and the workers who farm them are not much better off than the serfs of feudal days. Many of the farm workers live in country villages and travel to and from the estates.

Much of the plowing is done slowly by oxen. The threshing is often done under the hoofs of horses, walking on a stone floor. The wheat crop furnishes work for many persons at harvest time. These workers are unemployed at other times, and live on a starvation level. Agriculture in Spain is backward, but it is still the basic industry of the country.

**Minerals.** A large part of the mining in Spain has been paid for by foreign funds. The mines of Spain are old and famous. The copper, tin, and silver mines attracted the ancient Phoenicians to Spain thousands of years ago. Copper was mined in Spain before the time of Christ.

Today the mercury and salt-mining industries are owned by the Spanish government. The Cantabrian Mountains are an excellent source of iron ore. About

nine million tons of coal are mined yearly, but this amount is barely enough for the country's own use. Pyrites are mined and are a source of both copper and sulfur. Many Spanish mineral resources have not been fully developed.

**Manufactures.** The northern provinces are nearest to the trading centers of Europe, and Spain's largest manufacturing industries are located there. Cotton goods, woolens, and laces are the chief manufactures. These industries center in Barcelona. The country has 2,180 textile mills. There are many linen and paper mills in the northern provinces, and leather and tobacco are also produced.

Silk weaving is important in the south. Southern Spain also has a number of glassmaking factories. Sugar refining is a growing industry, and a few new iron and steel plants have been built. Seville produces a great volume of cork products. Barcelona's cork manufactures are smaller in amount but superior in quality. The water power of the mountain streams has been harnessed to produce electricity, and the use of electricity in industry has increased greatly. But Spain's manufactures still fall far short of its needs and its possibilities.

**Fisheries.** Fishing is less important in Spain than in many other European countries. Sardines, tunny, and cod are caught. The average yearly catch is about 450,000 tons. About 40,000 workers are employed in fish-canning factories.

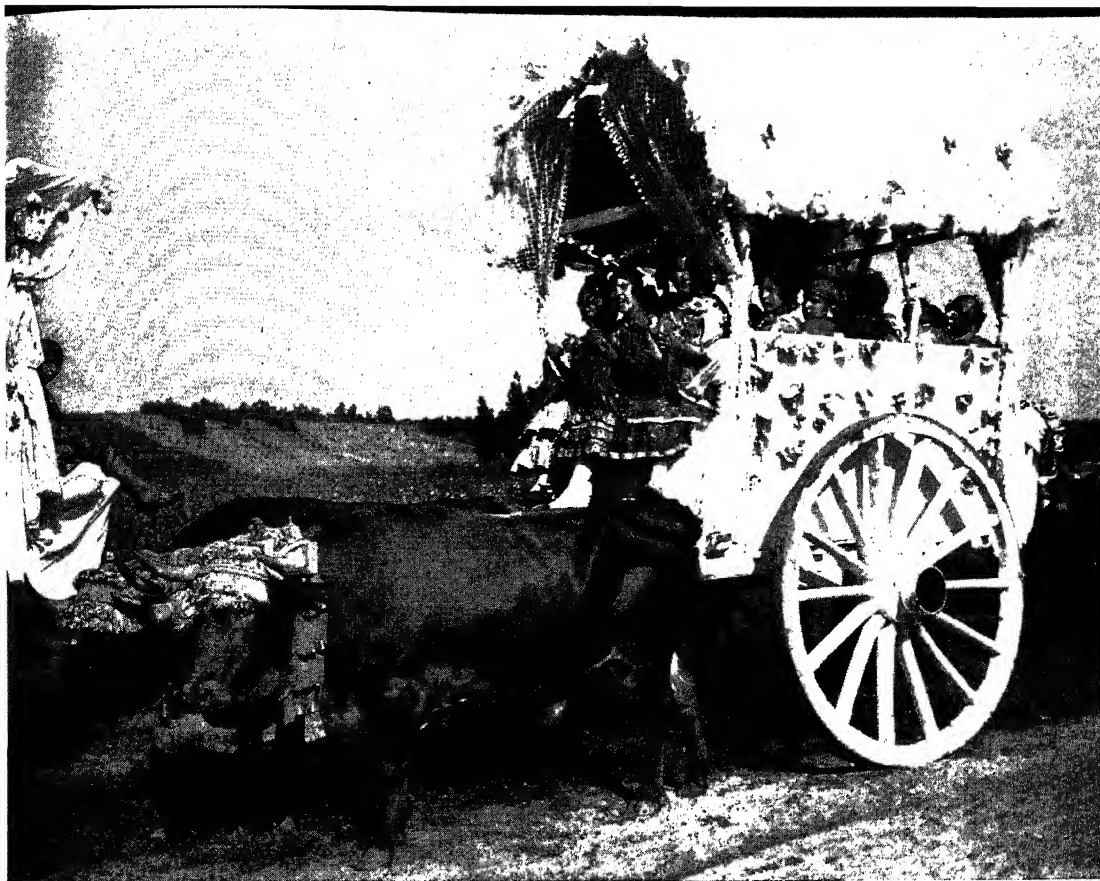
**Transportation and Trade.** Spain has more than 10,000 miles of railroads, all under government control. Streetcars and automobiles furnish transportation in the larger cities. Mule carts and ox teams are still the most common means of transportation throughout the country. The roads have been greatly improved, and about 7,000 miles are now concrete-surfaced. Both Barcelona and Madrid have subway systems for rapid transit. All the larger cities of Spain are linked together by commercial air lines. Other air lines connect Spain with many foreign countries.

Spain has twenty-one seaboard provinces on the Atlantic and the Mediterranean. But it is still not important as a European trading nation. Spanish trade reached a low point during the terrible civil war (1936-1939), and has been striving to recover ever since. In recent years the Spanish merchant marine has been enlarged. It carried on a profitable trade during World War II, in which Spain remained neutral. Much of Spain's trade is with France, the United States, Argentina, and Cuba. But Great Britain has long been Spain's chief customer.

Wine is Spain's chief export. Other products shipped include cork, metals, olives and other fruits, sugar, timber, livestock, glassware, pottery, wool, and cotton goods. The chief imports are foodstuffs, livestock, machinery, coal, raw cotton and linen, motor vehicles, and drugs and chemicals.

**Communication.** Spain has more than 26,000 miles of telegraph lines. American technicians have developed the Spanish telephone system, and there are now about 365,000 telephones in the country. There are also a number of modern radio broadcasting stations.

**Cities.** Spain has forty cities with populations of over



Burton Holmes, Ewing Galloway

**Pilgrims from Seville, Spain,** halt for a moment in their journey toward a little shrine forty miles from the city. Every year hundreds of persons leave Seville to celebrate the "Fiesta

50,000. Most of these cities are old, and many are famous in history. The cities of Spain are rich in tradition and in the buildings and customs of older times. The cities of Barcelona, Madrid, and Valencia are described under their own names in *THE WORLD BOOK ENCYCLOPEDIA*. Other interesting cities of Spain are described below.

**Badajoz, BAH thah HOTH** (estimated population 71,648), is a city of southwestern Spain, and the capital of Badajoz province. It lies along the Guadiana River, five miles from the Portuguese border. The town is famous for its fortresslike cathedral and for a great ruined Moorish castle. It has factories for the manufacture of soap, leather, and hats.

In 1812 Badajoz was attacked and taken by the Duke of Wellington during the Peninsular War. The town bull ring was the scene of a bloody massacre of the Loyalists during the Spanish Civil War.

**Bilbao, bil BAH oh** (estimated population 205,717), is a manufacturing and trading center in the mountains of north-central Spain, eight miles from the shores of the Bay of Biscay. It has been called the "Pittsburgh of Spain." The city is in the Basque country and was the capital of the short-lived Basque Republic during the Spanish Civil War.

Bilbao is an important seaport, even though it is not on the coast, because the Nervion River is navigable from Bilbao to the sea. The city is the center of the Basque iron-mining district. Exports include iron, wine, flour, paper, glass, and animal hides.

**Burgos, BOOR gohs** (estimated population 62,474), is a market center of north-central Spain, and the capital

of the Dew." Many travel in gaily decorated carts, and the atmosphere is like a carnival. If one wagon breaks down, the whole line stops until repairs are made.

of the province of Burgos. The city is built around a low hill, and is bordered by the Arlanzon River. A new suburb lies across the river from the old town, and small factories there manufacture leather and woolen goods, and paper.

Burgos was the capital of Old Castile until 1087, when the royal court was moved to Toledo. When Columbus returned from his second voyage to America, Ferdinand and Isabella welcomed him home in the great hall of the Casa de Cordón in Burgos. This building still stands on the Plaza de Libertad. El Cid, the national hero of Spain, was born in Burgos, and lies buried in the cathedral. During the Spanish Civil War, the city was for a time the capital of the Franco government.

**Cádiz, KA diz** (estimated population 92,998), is one of the great seaports of Spain. It is situated sixty miles northwest of Gibraltar on the Atlantic Coast, and is the capital of the province of Cádiz.

The city is well built, strongly fortified, well paved, and very clean. Its snowy, whitewashed buildings rise abruptly from the blue waters at the city's edge. The chief buildings are the great hospital, the customhouse, the old and new cathedrals, the theaters, the bull ring, and the lighthouse of Saint Sebastian.

The medical department of the University of Seville is located at Cádiz. The city also has a theological seminary, and several commercial and art schools. The Bay of Cádiz has an excellent natural harbor and is protected by the neighboring hills. The Bay has four forts. Two of these form the defense of the grand arsenal at La Carraca, four miles from Cádiz. Cádiz has long been Spain's chief naval station. The exports are mainly wine and fruit.

Historians believe that the Phoenicians founded Cádiz in 1130 B.C., and that it is the oldest city in Europe. They named the city *Cádir*, which means *fenced city*. The settlement prospered and became one of the great outposts of the Phoenician power. About 50 B.C. Cádiz found itself threatened by the native Iberian tribes, and called on Carthage for help. Carthage sent forces to help Cádiz, but the Carthaginians then annexed the city. The Romans seized Cádiz from the Carthaginians. Hundreds of years later the city became a Moorish stronghold. In 1262 King Alfonso X of Castile drove the Saracens, or Moors, out of Cádiz. The English occupied the city in 1596. During the great years of the Spanish Empire the riches of the New World poured into Cádiz, and the city became enormously wealthy. Cádiz then shared in the general decline of Spain, and lost much of its earlier commercial importance.

**Cartagena**, *kahr tah JE nah* (estimated population 117,075), is a seaport of southeastern Spain. Cartagena stands on a beautiful bay of the Mediterranean and is twenty-seven miles south-southeast of Murcia. The harbor of Cartagena is strongly fortified, and is protected from winds by the surrounding hills. It is the second largest harbor of Spain. Cartagena has factories which produce cordage, canvas, and iron. Copper, zinc, lead, and iron mines lie near by, and some of these ores are refined in Cartagena.

Cartagena's mines attracted the Carthaginians in ancient times. It became a Carthaginian settlement but was taken by the Romans under Scipio in 210 B.C. It was then said to be one of the richest cities on the Mediterranean. The Goths later destroyed the city and it did not regain its importance until the reign of Philip II (1550-1598).

**Córdoba**, *KAWR doh vah*, in English, Córdova (estimated population 148,990), is an ancient Moorish city which had great importance during the Middle Ages. It lies eighty-six miles northeast of Seville, on the banks of the Guadalquivir River. The streets of the old city are narrow, crooked, and often dirty. The modern section of Córdoba shows few traces of the Moorish occupation. The most remarkable building in the city is the great cathedral.

Like most Spanish cities, Córdoba was once a great trading center. At the height of its ancient splendor, it had a population of more than a million persons. Córdoba became less important after the Moors were driven out of Spain.

**Granada**, *grah NAH dah* (estimated population 161,888), is another old Moorish center. It lies forty miles inland from the Mediterranean, in the foothills of the Sierra Nevada range, in southeastern Spain. The city is 2,195 feet above sea level. Granada has a few factories which manufacture textiles, paper, leather, macaroni, and chocolate. Some trade is carried on with the surrounding towns.

The streets of Granada are narrow and crooked. The architecture is picturesque and shows the Oriental influence of the Saracens, who made Granada their capital. The buildings range from the shabby huts of the poor to the glorious Alhambra palace. Here and there are old Moslem churches which have been remodeled for Christian worship.

Granada, even in its decline, is perhaps the most colorful city in Spain. It seems almost to belong to a different world and another age. The costumes of the people are gay, gypsies walk through the city streets, and the old Moorish ruins are everywhere.

Granada has many sections and suburbs. The Darro River sets off some of the suburbs from the modern city, which lies to the north. Many of the gardens, broad walks, and fountains of the Moorish days have been preserved. The beautiful *Generalife*, a Moorish palace which was used as a summer home by the Moslem princes, lies a little to the north of the city.

Granada has many schools and charitable institutions. The University of Granada was founded in 1526. The great cathedral stands on the ground where the principal Moorish mosque once stood. The cathedral was begun in 1529 and finished in 1703. The tombs of Ferdinand and Isabella lie in the Royal Chapel of the cathedral.

Granada was founded by the Moors around A.D. 750. It reached the height of its power in the 1200's, when it was the center of Moorish wealth and learning, and the capital of the Moorish state. Granada resisted many assaults of the Christian kings of Spain, until it was the last stronghold of the Moors in Europe. In 1492 the armies of Ferdinand and Isabella conquered the independent province of Granada, and all Spain became Christian. Granada was a city of 400,000 at the height of its power, but a gradual decline set in after the city's surrender.

**Málaga**, *MAH lah gah* (estimated population 257,755), is one of the chief Spanish seaports, and a thriving manufacturing center. Málaga lies on the Mediterranean Sea, sixty-five miles northeast of Gibraltar. Exports from Málaga include large quantities of olives, olive oil, wine, raisins, lead, almonds, lemons, grapes, and esparto grass. Manufacturing has been encouraged, and busy factories produce cotton and linen goods, artistic pottery, soap, chemicals, iron products, and sugar.

Málaga is famous for its mild, even climate, and is a popular resort for invalids. The beautiful Alameda boulevard has been laid out near the shore line, and the city has handsome residential districts. A seven-hundred-year-old Moorish castle still stands in the older section of Málaga.

**Murcia**, *MUR shih ah* (estimated population 205,381), is a trading center in southeastern Spain. It lies in the midst of one of the most fertile and beautiful valleys of the country, on both banks of the Segura River. Murcia is twenty-five miles from the Mediterranean shore. Promenades and pleasure gardens stretch along the river banks, and mulberry, fig, and olive groves grow within the city. Silk-making is the chief industry.

Murcia has been controlled by the Romans, the Moors, and the Spaniards in turn. Some of its old buildings are still standing. The most interesting of these is the great Gothic-Romanesque cathedral, which was begun around 1350.

**San Sebastian**, *sah BAHS TYAHN* (estimated population 112,036), is a beautiful resort on the Bay of Biscay, twelve miles west of the French border. It is the capital of the Basque province of Guipuzcoa. The city is built on an isthmus which separates steep Mount Urgull from the mainland. In the days of the monarchy, San Sebastian was the summer residence of the Spanish royal family. It is a thriving, rapidly growing city and has considerable manufacturing. Its products include sailcloth and cotton goods.

On the west side of San Sebastian are a landlocked harbor and a magnificent beach. The cramped and crowded older section was almost destroyed by fire in 1813, but was rebuilt along much the same lines. The newer section is roomy and beautiful. A fine boulevard has been built along the isthmus. The new town has a modern harbor, broad streets, and fine buildings. The Renaissance church of Santa Maria and the royal palace of Miramar lend beauty to the city.

**Saragossa**, *sah rah GAHS ah*, in Spanish, *Zaragoza*, *thah-rah GO thah* (estimated population 248,338), is a prosperous trading center in northeastern Spain. It lies on the right bank of the Ebro River, 212 miles northeast of Madrid. Saragossa is built on the site of an ancient town of the early Iberians. The city is important as a railroad center and as a center of trade for a fertile farming region.

People sometimes say that Saragossa is both the oldest and newest of Spanish cities. The central part of the city is a district of ancient, crooked lanes and dilapidated



Ewing Galloway

**Lamparilla Street in Toledo, Spain**, winds between the steep stone walls of close-built houses. Narrow iron balconies

houses. But a modern section with fine, broad avenues and handsome homes and buildings has been built around the old quarter.

The city's name comes from *Cassarea Augusta*, which was the name Emperor Augustus gave to the settlement in 25 B.C., when he made it a Roman colony. Saragossa was once the capital of the old kingdom of Aragon. See CASTILE AND ARAGON.

**Seville, SEV il**, in Spanish, *Sevilla*, say *VEEL yah* (estimated population 328,668), is famed in poetry and song. The city lies about sixty miles northeast of Cádiz. It is situated on the Guadalquivir River in the midst of a country of sunny vineyards and blossoming orange groves. Spaniards have called Seville the "White City on the Guadalquivir" and the "Queen of Andalusia." Spain's two greatest painters, Diego Rodríguez de Silva y Velázquez and Bartolomé Esteban Murillo, were born in Seville.

Seville was the home of the Moors for many hundreds of years. The Moorish influence still shows in the network of small, shaded streets, and in the quaint, balconied houses built around handsome courtyards and fountains. The work of the Moors also shows in the fine squares studded with fountains.

A great wall with sixty-four towers once surrounded the city, and its remains may still be seen. But Seville has been enlarged and modernized in recent years, and has lost much of its Moorish atmosphere. Seville's greatest building is its cathedral, which was started in 1402 and finished in 1519. The cathedral was built on the site of a Moorish mosque. Near by are the Court of Oranges and the beautiful bell tower called Giralda, which has twenty-two sweet-toned bells. The Alcázar, an ancient palace of the Moorish kings, was one of the glories of Seville, but was greatly damaged by gunfire in the Spanish Civil War.

Seville is second only to Madrid as a center of art, literature, and university education in Spain. Seville also is an important manufacturing center. Its factories produce cigars, pottery, silks, machinery, chocolate, perfume, and iron products. During the 1600's Seville was one of the richest of the chief trading cities of Spain. It later declined, but is now regaining its

look down on the quiet street that has changed little since the time that the Moors were the rulers of Spain.

former importance as a center of trade and industry.

**Toledo, toh LEE doh** (estimated population 34,592), is one of the proud cities of ancient Spain. It lies on the Tagus River forty-one miles southwest of Madrid. The city stands on a high hill. The Tagus flows through a deep ravine around the base of the hill. Irrigation has made the near-by region almost an oasis.

Toledo is a gloomy medieval city of narrow, winding streets and ancient buildings. Its architecture shows a strong Moorish influence. A great early Gothic cathedral is the chief building. Toledo was once the capital of the Visigoth kingdom in Spain, but it has lost much of its early importance. The Arabs destroyed the city in the 700's. Toledo was later rebuilt and became a great center of learning under the Caliphs of Cordova. In 1085 Alfonso the Valiant took Toledo from the Moors and it became the capital of Old Castile.

**Valladolid, VAHL yah thoh LEETH** (estimated population 122,141), stands on the left bank of the Pisuerga River, about a hundred miles northwest of Madrid. Points of interest include the 500-year-old Colegio de Santa Cruz. This is an art gallery which contains world-famous paintings, and some excellent sculptures. The Church of Santa María la Antigua was founded in 1088. Columbus spent his last days in Valladolid, and the house where he died still stands.

**Vigo, VE goh** (estimated population 130,431), is a seaport of Galicia. It is situated on a narrow inlet of the Atlantic. Vigo lies in northwestern Spain, a short distance from the northern border of Portugal. The old section of Vigo has steep streets and old houses, but there is a new district which is very modern. The Calle del Arenal is a beautiful boulevard which follows the line of the harbor and gives an excellent view of the bay. Vigo exports tunny, sardines, wine, and some agricultural products.

#### Social and Cultural Achievements

**Leading Universities:** *University of Madrid*, founded in 1508; *University of Barcelona*, founded in 1450; *University of Valencia*, founded in 1245; *University of Salamanca*, founded in 1220; *University of Granada*, founded in 1526.

**Leading Museums and Art Galleries:** Museo del Prado



and *Academia de Bellas Artes* at Madrid; *Palacio de Bellos Artes* at Barcelona; *Casa Greca* at Toledo.

**Education.** The Spanish schools are not so advanced as those in other countries of western Europe. About 40 per cent of the Spanish people can not read or write. But in 1900, 63 per cent of the people could not read or write. In 1857 a law was passed which established compulsory education for children up to the age of twelve, but this law has been poorly enforced.

Some mountain regions of Spain have very few schools. The mountain roads are poor and travel is difficult, so many children cannot reach the few schools that have been built. The Spanish republic was greatly interested in education, and during its short life built new schools at the rate of 1,000 each year. But Spain still does not have enough schools.

Public schools are supported by local taxation and are under government inspection. There is at least one high school in each province. The high schools prepare students for the twelve universities of Spain. The government also supports special schools where engineering, agriculture, music, and fine arts are taught. The universities of Spain have an average yearly attendance of about 35,000.

Spain also has a number of private schools, and Catholic grade and high schools. The church plays an important part in Spanish education. The Roman Catholic Church controls the church schools, which include all grades, from kindergarten through college. The republic closed the church schools, but the Franco government reopened them.

**Arts and Crafts.** Some of the world's greatest artists and writers have been Spaniards. Lopez de Vega was a great writer of plays. Velázquez, Francisco de Goya, and Bartolomé Murillo were world-famous Spanish painters. El Greco was born in Greece, but is ranked as a Spanish painter because he lived and worked in Spain.

The first great Spanish writings were the *Poema del Cid*, and the *Auto de los Reyes Magos*. Scholars believe that the epics date from the 1100's, but no one knows who wrote them. From 1550 to 1650 great literature was produced in Spain. Lopez de Vega wrote his famous plays, and Miguel de Cervantes wrote *Don Quixote*. In more recent times, Spain has produced many famous writers and playwrights. See SPANISH LITERATURE.

Spanish music is often crude in form, but it has a vitality and rhythm that have made it loved in many countries of the world. Much of the music of Latin America is based upon that of Spain. Some of the loveliest, saddest, and most haunting lyrics set to Spanish music are those of the Loyalists in the Spanish Civil War. They were written and sung in many tongues besides Spanish—by the anti-Hitler Germans, by the Americans of the Lincoln Brigade, by the French, and by the bands of men from many other lands who came to Spain to fight against the Fascist forces.

**Religion.** Almost all the people in Spain belong to the Roman Catholic Church. The Catholic Church lost its position as the state church under the republic, but the Franco government restored it. The government gives financial support to the Catholic Church, and has returned to the Church the properties which were confiscated by the republic.

## Government

The Spanish Government became a dictatorship of the Fascist type in 1939. General Francisco Franco assumed the title of *El Caudillo*, or *the leader*. In 1947, however, the Spanish Cortes, or National Congress, adopted a law which provided that Spain should become a monarchy upon Franco's death. This law gave the Cortes the power to elect a king. Until then, Franco was to remain chief of state and head of the Falange, the only political party permitted in Spain.

The Falange is directed by a National Council of 103 members. A cabinet of thirteen members assists Franco in directing various departments of the government. The Cortes, although it is the supreme lawmaking body of Spain, is subject to the chief of state and is not a powerful body. Only a part of its 438 members, called *Procuradores*, or *attorneys*, are elected by the people. The Cortes is made up of the thirteen members of the cabinet, the 103 members of the Falange National Council, the heads of the twelve universities of Spain, representatives of various professions, and representatives of various capitals and provinces. Each province of Spain has its own assembly, which has authority in certain local matters.

Spain was a monarchy until 1931. The republic was proclaimed in that year, and lasted until the end of the civil war in 1939. The Franco dictatorship then took over control of the Spanish Government. The new Cortes was established by General Franco in July, 1942.

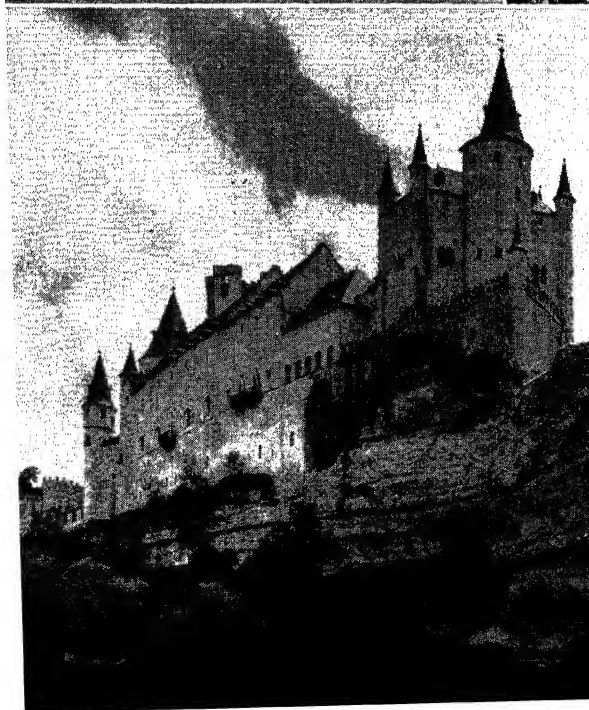
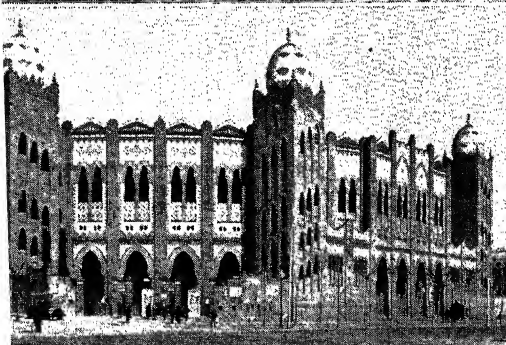
The Spanish republic was ruled under a constitution adopted in December, 1931. This constitution was based on the principle that "Spain is a democratic republic of workers of all classes." The republic was strongly socialistic. Church and state were separated. Education was taken out of the control of the Church, and the Government moved to break up the great estates and distribute them among the peasants. The republic was overthrown by General Franco.

**Colonies.** Spain's once-mighty empire has melted away, but a few fragments still remain. Rio de Oro, Spanish Guinea, and Ifni are Spanish possessions on the western coast of Africa. Spain still has the islands of Fernando Poo, Annobon, and Corisco, and the Elobey Islands. All these are in the Gulf of Guinea. Spain also has a protectorate over Spanish Morocco, and controls that region.

The total area of all these possessions, including Spanish Morocco, is 134,716 square miles. The population is 1,491,000. The Canary and Balearic Islands are considered as part of Spain itself. The colonial government of Spanish Guinea and of the islands in the Gulf of Guinea is centered at Fernando Poo. Rio de Oro is under the government of the Canary Islands.

Spanish Morocco lies just south of Gibraltar. Its location is its chief importance to Spain. Its commanding position on the Strait of Gibraltar adds greatly to Spain's influence. Morocco is also the homeland of the Moors, and the Spanish Government has made much use of these obedient African soldiers.

The Spanish Sahara is a large area of little value. Many of its people are nomads, who visit it only in the rainy season. The Guinea territories export cocoa, copper, vegetables, fruits, and timber to Spain.



#### PICTURESQUE SPAIN

*Top:* The ruins of a castle built in the village in Coca, in northern Spain, during the fifteenth century. The burro-drawn cart is still a common mode of travel in the rural districts. *Second left:* Bullfighting is the national sport, and most cities have at least one bull ring. Pictured here is the exterior of the Plaza de Toros (Bull Ring) at Barcelona. *Second right:* Many Spanish buildings are built around a flower-gay patio or open-air courtyard, such as this in the Palace of the Dueñas at Seville. *Below:* The Alcazar, a castle at Segovia, the scene of the coronation of Isabella as the Queen of Castile in 1474.

Photos: James Sawlitz; Ewing Galloway

lished by the division of small kingdoms among the sons of various Visigothic kings.

The civilization of Spain during this period was higher than that of most of the other European countries. Spain was more greatly influenced by the Moorish civilization of the Middle Ages than any other country of Europe. This Moorish influence is one of the most important factors in Spanish history. The Moslem Moors of the Middle Ages were far more advanced than the people of feudal Europe.

The Moors affected the life of most of southern Europe to some extent. But their occupation of Spain profoundly changed the ways of living there. They introduced a skillful system of irrigation which enabled Spain to support a vastly greater population. The craftsmen of Córdoba were well known throughout Europe for their beautiful leatherwork. The people of Toledo became famous for their flawless steel swords. The Moors brought the Moorish arch to Spanish architecture, and architects of many countries still use it today. The Moors built some of the most beautiful buildings in the world at Granada. The names of Spanish cities which begin with *Al*, such as Alicante and Alcalá, are of Moorish origin.

The non-Moorish kingdoms of Spain shared in the general Spanish prosperity. Their education, trade, and farming methods reached a high stage of development. But the Moors never regained the great strength which in A.D. 732 had carried them as far north as the gates of Tours, in France. The pressure of the Christian kingdoms gradually forced them back into the south.

All of the Christian kingdoms of Spain united against the Moors in the 1200's. Castile was one of the most powerful of these small states, and was a leader in the attack on the Moors. The Moorish princes were overcome one by one, until the Moorish kingdom was finally reduced to the single southern state of Granada.

**The Union of the Independent Kingdoms.** Castile was now the most powerful of the Spanish kingdoms. Aragon, in the northeast, was another powerful state. In 1469 Ferdinand II of Aragon married Isabella of Castile. Ten years later the two states were united into a single kingdom. This union was the beginning of a process which went on until all the independent kingdoms of Spain were finally united into a single powerful country. Ferdinand and Isabella sent Columbus to the New World and won a vast new empire abroad while they built up the Spanish country at home. They were followed by the great monarchs Charles V and Philip II, and Spain enjoyed a hundred years of continued success and military glory.

Ferdinand and Isabella used their royal powers to their fullest extent. They were Catholic rulers, and they were determined to make Spain wholly a Catholic Christian state. The Spanish Inquisition followed their determination to make Spain completely Catholic. The Inquisition was established as a department of the royal government. It hunted down the most remote suspicions of unbelief in Christian doctrine, and was especially harsh toward the Jews and Moslems. The Jews were persecuted and driven out of Spain.

Ferdinand and Isabella decided to rid Spain of the faith of Islam forever. They attacked Granada, and

after a struggle of ten years the Moors lost their last foothold in Spain. In 1492 they fled to Africa, and Spain became a Christian state. Christopher Columbus, financed by Queen Isabella, discovered America in the same year. Spanish explorers extended Spanish claims over the territories that are now Mexico, Central America, Peru, Venezuela, Chile, Cuba, Jamaica, and the Dominican Republic.

Spanish troops extended Spanish conquests to Africa, and to Malacca and the Spice Islands in Asia. With the gaining of the Philippines, the Spanish Empire circled the globe. Spain also conquered Navarre, Roussillon, Portugal, The Netherlands, Naples, Sicily, Sardinia, and the Canary and Balearic islands. Spain became "the mistress of the world and the queen of the ocean."

**The Spanish Decline.** But Spain's hour of glory was short. The errors of the proud Philip II (1527-1598) were the beginning of the downfall of Spain. In 1588 Philip launched his great Spanish Armada of 130 warships to attack England. Battered by wild storms and English guns, the Armada was destroyed, and Spain lost its naval supremacy forever. England became the great sea power of the world.

The Spanish power declined steadily during the 1600's. Revolts, religious persecutions, bankruptcy, and civil war weakened the kingdom. Philip III, Philip IV, and Charles II came and went, but Spain did not recover. The Netherlands were lost. Spain was defeated in the War of the Spanish Succession in 1714, and surrendered Naples, Parma, Sardinia, and Milan to Austria. Spain also gave up Sicily to Savoy, and England seized Gibraltar and Minorca.

**Relations with Great Britain and France.** But Spain still had its enormously wealthy overseas empire. A period of prosperity followed the War of the Spanish Succession. But at the beginning of the 1800's the Napoleonic Wars brought Spain to the edge of ruin.

Spain entered the war against the French republic. The war was a failure, and Spain lost Santo Domingo to France. Spain then joined the French and went to war against Great Britain. The combined French and Spanish fleets put out to sea to fight the British. They met the British fleet at Trafalgar, in October, 1805, and suffered a defeat so terrible that the weakened sea power of Spain was permanently destroyed. Napoleon later put his brother Joseph on the Spanish throne, and war broke out again between France and Spain.

**Period of French Control.** Napoleon quickly defeated the Spanish and entered Madrid in triumph in 1808. But the Spanish people resisted the French occupation bitterly, and guerrilla fighting continued. Napoleon soon left Madrid and continued his conquests in the provinces. He then turned his command over to his generals and returned to Paris. This fighting was the early part of the Peninsular War, in which Spain, Portugal, and Great Britain fought against Napoleon.

Joseph Bonaparte wanted to create an independent Spanish empire for himself. He called a Cortes, or Congress, in 1810. The Cortes vowed allegiance to him as the new king. It also approved the new constitution drawn up by Joseph's government in 1812. The new laws ended the Inquisition, put certain church lands



Black Star

**Harvesting Wheat in Spain** is done much the same today as it was in olden times. The chaff, which covers the wheat

kernel, is first beaten loose with a flail. The wind then carries off the light chaff as the grain is moved.

under the control of the government, abolished feudal rights, and curbed the power of the Catholic Church.

Spain submitted quietly to these reforms. The Spanish leaders disliked them, but they believed that the French would soon be driven out and the new constitution discarded. They were correct in their belief. In 1809 the Duke of Wellington took command of the British forces in the peninsula, and began a vigorous campaign against the French. The support of Great Britain enabled Spain to throw off the rule of Napoleon.

The British were victorious in Portugal, and drove on into Spain. Napoleon had left a large army in the country under Marshal André Masséna. The French emperor relied on this force to hold Wellington back, and if possible to drive him out of Portugal. But Wellington marched from victory to victory. Aided by Spanish troops, Wellington had completely defeated the French in Spain by the end of 1813.

**Dissatisfaction and Revolt.** King Ferdinand VII of Spain was restored to his throne in March, 1814. The constitution of 1812 was speedily revoked, and an effort was made to return to prewar conditions. But the Spanish colonies in the New World had revolted during the struggles to save Spain from Napoleon. Uruguay, Paraguay, Chile, Venezuela, and New Granada had thrown off Spanish control.

These losses caused dismay in Spain. The government was held to blame, and the weak and incapable king became increasingly unpopular. The garrison at Cádiz mutinied. This started a military revolt that quickly spread across the country. The king was taken prisoner. The Inquisition and special powers and privileges of the Church were again abolished. General disorder and lawlessness reigned. The people of other European countries became alarmed at the civil strife in Spain because they feared it would spread to the rest of Europe. The Czar of Russia proposed intervention in Spain, but Great Britain and Austria decided against such a course.

These were dark years for Spain. The country was made poor by the loss of its colonies, and strife and disorder continued. At the Congress of Verona in 1822, France requested permission to send troops into Spain and bring order to the country. Great Britain remembered the previous French activities in the peninsula and objected to the proposal.

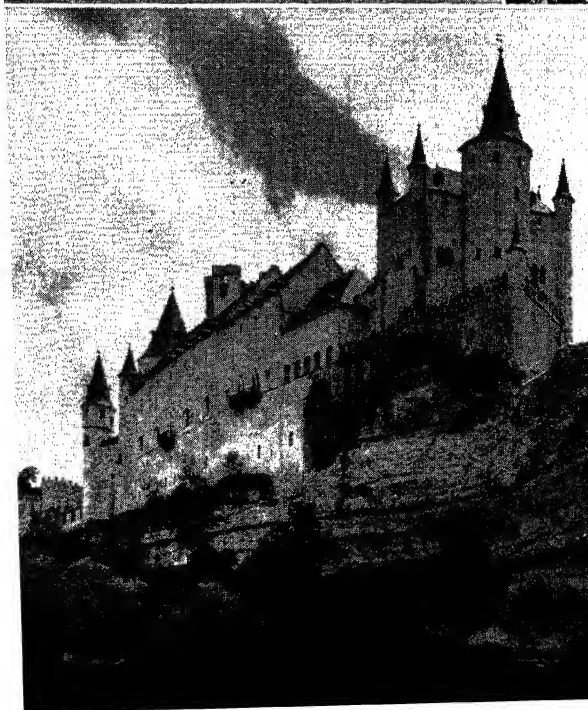
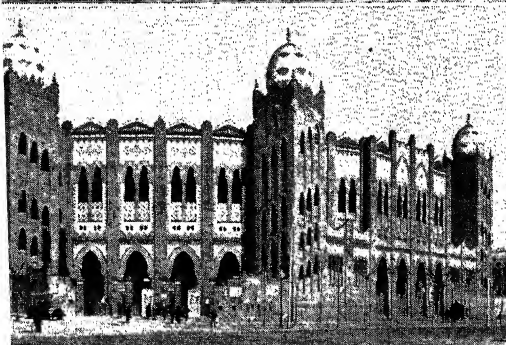
But in 1823 the French sent an army into Spain under the command of the Duke of Angoulême. Order was soon restored and Ferdinand was again returned to his throne. No sooner was the king back in power than he repealed all liberal measures and again attempted to set up the old feudal order of Spain. The following years saw Spain torn between the king and the Church on one side, and the liberals on the other.

Ferdinand died in 1833. He was followed by his infant daughter Isabella, with her mother, Maria Christina, as regent. The Church, or *Carlist* party, wanted Charles V to be king, and plotted against Isabella and Christina. This forced Christina to seek support from the liberals in order to maintain her position. She was compelled to follow a policy of reform in order to keep her liberal supporters.

The plots of the Carlists continued. The situation finally became so distasteful to Christina that in 1840 she resigned the regency in favor of a liberal, Baldomero Espartero. Isabella was duly crowned when she came of age, but disorder and unrest made her rule a difficult one. Queen Isabella was forced to abdicate in 1868, in the midst of insurrection and revolt. A provisional government was then established.

**The New Spanish Monarchy.** The conditions in troubled Spain did not improve, and two years later the Cortes voted to make Spain a monarchy again. The royal family had been banished, so Spain sought for a ruler in other countries. An Italian, Amadeus, Duke of Aosta, was selected. He ruled only two years, and resigned in 1873. A short period of republican government





#### PICTURESQUE SPAIN

*Top:* The ruins of a castle built in the village in Coca, in northern Spain, during the fifteenth century. The burro-drawn cart is still a common mode of travel in the rural districts. *Second left:* Bullfighting is the national sport, and most cities have at least one bull ring. Pictured here is the exterior of the Plaza de Toros (Bull Ring) at Barcelona. *Second right:* Many Spanish buildings are built around a flower-gay patio or open-air courtyard, such as this in the Palace of the Dueñas at Seville. *Below:* The Alcazar, a castle at Segovia, the scene of the coronation of Isabella as the Queen of Castile in 1474.

Photos: James Sawyers; Ewing Galloway



followed, and then a new constitutional monarchy was set up. The son of former Queen Isabella was crowned as Alfonso XII. Alfonso ruled from 1874 until his death in 1885.

**The Reign of Alfonso XIII.** King Alfonso died shortly before the birth of his son, Alfonso XIII, last of the Spanish monarchs, was thus born a king. His mother, Maria Christina, acted as regent until Alfonso came of age in 1903. The chief event of the regency was the disastrous Spanish-American War in 1898. The war ended in a swift and terrible defeat for Spain. Cuba, Puerto Rico, and the Philippines, the remnants of a once-mighty empire, were surrendered to the United States.

Defeat abroad and poverty at home continued to cause unrest in Spain. Trade unions grew up in the cities. Anarchists, syndicalists, and union leaders led organized protests against the injustices of Spanish life. But Spain's feudal ruling class was not worried by this opposition, and little was done to improve conditions.

Francisco Ferrer Guardia, an anarchist leader who preached against the monarchy and the Church, led a revolt in Barcelona in 1909. The revolt was put down and Ferrer Guardia was executed, but the revolutionary movement continued. Discontent with the monarchy was strong even among the wealthy.

Spain remained neutral during World War I. In 1921 the Spanish army suffered a crushing defeat at the hands of the Riffian tribes of Spanish Morocco. General Primo de Rivera accused the government of responsibility for the Moroccan defeat and for other troubles which beset Spain. In 1923 he led a bloodless revolution and made himself dictator.

King Alfonso supported Rivera. The new premier declared martial law throughout Spain and governed by decree. He promised an early return to constitutional government, but always postponed this step. The king and the army finally turned against Rivera in 1930 and forced him out of office. Rivera was succeeded by General Frederico Berenguer. In 1931 Berenguer announced the restoration of the constitution, and called for a general election.

This announcement caused the political pot to boil over. All parties felt that a parliament held under such confused conditions would be useless. The king had become increasingly unpopular, and the antimonarchists kept up a continual agitation for a republic. The king chose Admiral Juan Aznar, a monarchist, to succeed Berenguer as premier. Aznar called a general election, and a convention to change the constitution.

**The Spanish Republic.** The election was held on April 12, 1931. Spain voted against the monarchy and Aznar resigned. Alfonso, who had been king of Spain for forty-five years, refused to abdicate formally. But he and the royal family left the country. Little violence marked the change of government.

Elections for a constitutional convention were soon held, and the Socialists won a decisive victory. The newly elected convention drew up a republican constitution, which was adopted on December 10, 1931. Niceto Alcalá Zamora was elected the first president of Spain. The new government was strongly anti-Catholic, because in the minds of many Spaniards, the Church was closely linked with the monarchy. The Jesuits were

driven from Spain. Other religious orders were either suppressed or brought under close state control. Church schools were closed and civil divorce was made easy.

This new government won the fierce hatred of the conservatives. An unsuccessful monarchist uprising took place, the leaders were imprisoned, and many members of the nobility were exiled. In 1932 the government yielded to the persistent demands of Catalonia and granted that province home rule. The situation throughout Spain was especially troubled by the world depression. The export market was poor and many of Spain's people were desperate.

In October, 1933, the Cortes was dissolved and an election was called. The conservative faction won, and the Catholic party was given greater powers in the government. The history of the Spanish republic from this point on was one of chaos. In 1934 a general strike broke out which led to a workers' insurrection in Asturias and other parts of Spain. But the government was strong enough to restore order.

The division in Spain grew wider. The leaders of the army, the monarchists, the great landowners, and the Catholic party united in opposition to the republic. They were opposed by the Socialists, Communists, Republicans, trade unionists, and most of the liberal groups in the country. The Right was ranged against the Left. Hatred became intense. It soon became obvious that a civil war in Spain was approaching.

The conservatives were ready to destroy the republic. President Zamora dismissed the Cortes in order to save his government, and elections were held again in February, 1936. For this election, all the radical and republican elements in Spain banded together in an organization called the Popular Front.

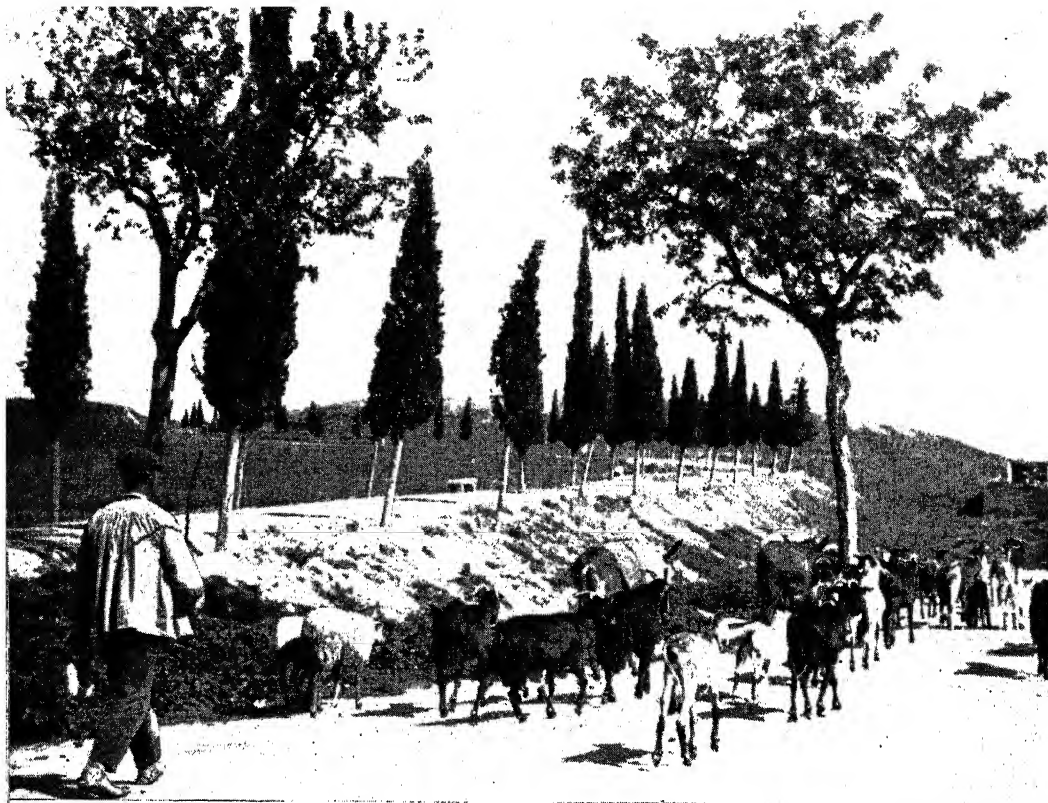
This combination won a majority and seized control of the Cortes. President Zamora was too moderate for the Popular Front, and he was removed on April 7, 1936. Manuel Azaña, who had been Zamora's premier for several months, became the new president.

The election of February had touched off an armed conflict between the Right and the Left. From February to July the greatest violence reigned in Spain. Monarchists and socialists fought each other in the streets. Individuals on both sides were dragged from their homes and murdered by armed bands. A war of reprisals raged.

The government was aware that certain army leaders were plotting to overthrow the republic. But the republican officials were afraid to arrest even the generals whom they knew to be disloyal. The more dangerous military commanders were merely ordered to duty at remote garrison posts. General Francisco Franco, the future leader of the revolution, was made military governor of the Canary Islands. The government's policy merely gave the generals leisure time in which to perfect their plans.

**Spanish Civil War.** On July 17 the military leaders suddenly proclaimed a revolution against the Spanish government. Army garrisons rose in revolt throughout Spain and the colonies. General Franco, a young officer of the regular army, became the leader of the revolt after the death of General José Sanjurjo in a plane crash.

Franco flew from the Canary Islands to Morocco and took command of the revolt there. With Morocco under



**Spanish Herdsman Driving His Goats and Sheep** along a road near Toledo. The rolling green plains of this region

furnish abundant pastures for grazing. Healthful goat's milk is more popular in Europe than in the United States.

control, Franco flew to the mainland, where he set up a Fascist government at Burgos. Franco called his government the *Junta de Defensa Nacional* and moved on Madrid.

A violent and bloody civil war followed. Both Loyalists and Rebels murdered civilians and indulged in brutal massacres of helpless prisoners. The Moors, native Moroccan troops brought into Spain by General Franco, were particularly guilty of atrocities. The war swayed back and forth across Spain for thirty-two months.

The Spanish Civil War has been called the opening battle of World War II, and the testing ground for the greater conflicts. It became a struggle between Franco's Fascist movement and the Socialist and democratic forces of Spain. The world could not ignore this struggle, and the nations of Europe soon began to take sides according to their sympathies.

At first the other countries agreed not to intervene in Spain. The League of Nations established a neutrality border patrol to keep foreign aid from reaching either side in the Spanish war. The United States passed a neutrality act which forbade the shipment of arms to either side.

But Italy and Germany began to lend open support to General Franco. The Pope declared his sympathy with Franco's government. Before many months had passed, 80,000 Italian troops had joined Franco's armies in the field. Germany sent a large number of technicians and aviators. New types of war material were given their first tryout on the battlefields of Spain.

Tardy aid also reached the Spanish republic from

France and the Soviet Union. Loyalist sympathizers from the United States and many other countries organized the Abraham Lincoln Brigade, which fought against the Rebels in Spain. Mexico openly favored the republic, while other Latin American countries sympathized with Franco.

In Spain itself, the Loyalists were aided by a desire for independence in certain regions. Catalonia had finally won self-rule. It now feared Franco's strong central government, and became one of the strongholds of the republic. The Catholic Basques also declared against Franco and set up a Basque republic of their own which allied itself with the Loyalists. Most of the wealthy elements in Spain rallied to Franco. Juan March, the richest man in Spain, was the most influential backer of Franco.

The Rebels received the lion's share of foreign aid. As the struggle wore on, the republic's only real measure of foreign support came from the Soviet Union. As a result, the Communists, who had been very few in number at the start of the war, became increasingly important. Communist police agents made use of their powers to settle old scores, and thousands of political murders were committed in Loyalist territory.

The better-armed Rebels held the military advantage from the beginning. They soon drove the Loyalists into the eastern half of Spain. Badajoz fell to Franco in August, 1936. In September, Francisco Largo Caballero, a Socialist leader, became premier of the republic. Two weeks later Franco's forces took Toledo and relieved the seventy-one-day Loyalist siege of the Alcazar. In Octo-

ber, Franco reached Madrid and laid siege to the city. But the Loyalists rallied and kept their grip on the capital. The seat of the government was later moved to Valencia, farther from the front.

Juan Negrin succeeded Caballero as premier in May, 1937. Madrid still held out, but the position of the republic became gradually worse as Franco methodically reduced the Loyalist territory. By October it was necessary for the Loyalists to move their capital again, this time to Barcelona. On April 15, 1938, Franco's troops reached the sea at Vinaroz, cutting the republic in two.

In December, 1938, Franco gathered his forces and launched a great offensive against the weakened republic. Within a month Barcelona had fallen and the government armies were breaking up. On February 27, Great Britain and France recognized Franco as the head of the Spanish government. President Azana resigned and fled to France, but Madrid grimly held out until the last. Franco's troops finally entered the city late on March 28, 1939. The fall of Madrid brought the war to an end. A million Spaniards had perished in the struggle, and Spain lay almost desolate under the misery of the war. Spanish agriculture and economy were equally torn apart and distressed.

**Dictatorship.** General Franco then set up a Fascist dictatorship. Hundreds of thousands of Loyalists were executed or imprisoned. The Franco government operated in close sympathy with the Fascist governments of Italy and Germany.

Spain was exhausted by the ravages of the civil war, and remained neutral during World War II. But volunteer Spanish forces fought beside the Germans on the Russian front. The Spanish Blue Division suffered heavy losses there. Spain continued to send valuable shipments of wolframite and mercury to Germany throughout the war.

The Franco government began to separate itself from the Axis when it became apparent that the Allies were winning the war.

R.PEA.

**Related Subjects.** The reader is also referred to:

## BIOGRAPHY

Albeniz, Isaac	Granados Campina, Enrique
Alfonso XIII	Herrera, Francisco de
Benavente y Martínez,	Iturbi, José
Jacinto	Las Casas, Bartolomé de
Blasco-Ibáñez, Vicente	Loyola, Saint Ignatius
Bori, Lucrezia	Martinez Sierra, Gregorio
Casals, Pablo	Murillo, Bartolomé Esteban
Cervantes Saavedra,	Pérez Galdós, Benito
Miguel de	Picasso, Pablo
Don Juan	Sarasate y Navascués, Pablo
Echegaray y Eizaguirre,	de
	Unamuno y Jugo, Miguel de
Falla, Manuel de	Vega, Lope de
Franco, Francisco	Velázquez, Diego Rodríguez
García	de Silva y
Goya y Lucientes,	Zamora y Torres,
Francisco José de	Niceto Alcalá

## CHIEF PRODUCTS

Cork	Mercury	Wine
Grape	Olive	

## CITIES

Barcelona	Madrid	Valencia
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## HISTORY

Aix-La-Chapelle, Treaties of	Armada
------------------------------	--------

Castile and Aragon	Iberia
Charles V, Holy Roman	Inquisition
Cuba (History)	Philip
Exploration and Discovery	Spanish-American War
Ferdinand V	Succession Wars
Granada	Torquemada, Tomás de

## PHYSICAL FEATURES

Biscay, Bay of	Pyrenees
Douro River	Tagus River
Ebro River	Tinto, Rio
Finisterre, Cape	Trafalgar
Guadalquivir	

## POLITICAL DIVISIONS

Andalusia	Canary Islands	Rio de Oro
Balearic Isles	Navarre	Spanish Guinea

## UNCLASSIFIED

Alcazar	Fiesta
Alhambra	Flag (color plate,
Andorra	Flags of Europe)
Basque	Grandee
Bullfighting	Guitar
Cid, The	Montserrat
Doll (color plate)	Spanish Language
Dress (Spain; color plate,	
Europe)	

## Questions

What Spanish town lies entirely inside France? How did this happen?

Why are there wide differences between different parts of Spain?

Why is travel difficult between France and Spain?

Where is the forest and cattle-raising region of Spain? Why?

What are Spain's chief trees? What forest product is one of Spain's chief exports?

Who are the Basques? What is their chief occupation? Where do the Castilians of Spain live?

What important minerals are found in Spain?

What city is often called "The Pittsburgh of Spain"? Why?

**SPALATO, SP4H lah toh.** See SPLIT.

**SPALDING, ALBERT** (1888- ), is an American violinist. He was born in Chicago, and at the age of seven began to study violin with Ulpiano Chiti in Florence, Italy. Later he attended the Conservatory of Bologna and then studied in Paris. There in 1905 he made his debut, which was followed by a concert tour of Europe. His first American appearance was with the New York Symphony Orchestra in 1908. Spalding then made successful concert tours in Europe. Spalding composed two violin concertos, a sonata for violin and piano, a string quartet, and other works. F.B.

**SPAN.** See BRIDGE.

**SPANDREL.** See ARCHITECTURE (Terms).

**SPANIEL, SPAN yel.** The spaniel family of dogs contains more breeds than any other dog family. Typical spaniels are the *clumber*, *cocker*, *English springer*, and *Welsh springer spaniels*, and the *field*, *Sussex*, and *American water spaniels*. Two cousins of these spaniels are the *Irish water spaniel* and the *Brittany spaniel* of France. The *English toy spaniel* is a distant relative.

The spaniel family is descended from a Spanish dog, and the name *spaniel* came from Spain. All breeds except the toy spaniel belong to the sporting group of dogs. The spaniel always has a gentle disposition, is eager to hunt in the fields, and has steady nerves. It is a fine



**The Cocker Spaniel** is a small, floppy-eared, short-legged dog. It is playful and gentle, and makes a fine pet.

companion as well as a good hunter. All spaniels have long silky coats. In general, the spaniels have long ears, rather large round eyes, broad skulls, and sturdy bodies and legs. The sizes of the dogs vary in different breeds.

The two leading breeds are the cocker spaniel and its larger brother, the English springer spaniel, which is often simply called "springer." There are two varieties of cocker spaniel—the American and the English. They weigh from twenty-two to twenty-eight pounds and may be solid black, red, red and white, black and white, or other colors. They are the leading breed in registrations, show entries, and popularity in the United States.

The springer usually weighs about forty-five pounds, and is a splendid all-around hunting dog. It can be used in water or on land, and is excellent for hunting all kinds of game. Most spaniels rush to where the game may be hiding and flush it into the air. This hunting method is different from that of the pointer or setter, which stops and holds its body rigid in a "point" while the hunter flushes the bird himself, or waits until it takes to flight. The Brittany spaniel acts like a pointer when hunting.

The spaniel family was developed chiefly in England. The Irish water spaniel, which has some poodle blood, is liver colored, curly coated, and used mostly for water hunting on ducks and similar game. It is sometimes called the rattail spaniel. The American water spaniel is the only American member of the family. It has a brown, curly coat, and weighs about thirty-five pounds.

See also DOG (color plates).

S.E.M., Jr.

**SPANISH AMERICA** is the name sometimes given to Latin America. It includes all Central and South America and those islands of the West Indies which once belonged to Spain. See also LATIN AMERICA.

## SPANISH-AMERICAN WAR

**SPANISH-AMERICAN WAR.** In February, 1898, a great explosion shook the harbor at Havana, Cuba. The blast destroyed the United States battleship *Maine*, which burst into flames and sank in the harbor. Two hundred and sixty American seamen were killed. The sinking of the *Maine* set the stage for the war between the United States and Spain.

The Spanish-American War began in April, 1898, and ended four months later. It grew out of American sympathy for the oppressed peoples of Cuba. But some Americans favored the war for other reasons. They saw in it an opportunity for the United States to become a great world power. The war ended in American victory, and the United States won possession of Puerto Rico, Guam, and the Philippines, and independence for Cuba.

**Causes of the War.** For many years before the war the Cuban people had suffered under the harsh rule of Spanish colonial masters. The Cubans had no elected legislature, and only the rich had any influence in the affairs of the colony. Taxes were used to support Spanish officials and to keep up a strong army and navy. The government did little to help the Cuban people. Cuban trade with Spain and with other countries was heavily taxed. The Cubans revolted many times against the Spanish dictators, but the uprisings brought few government reforms.

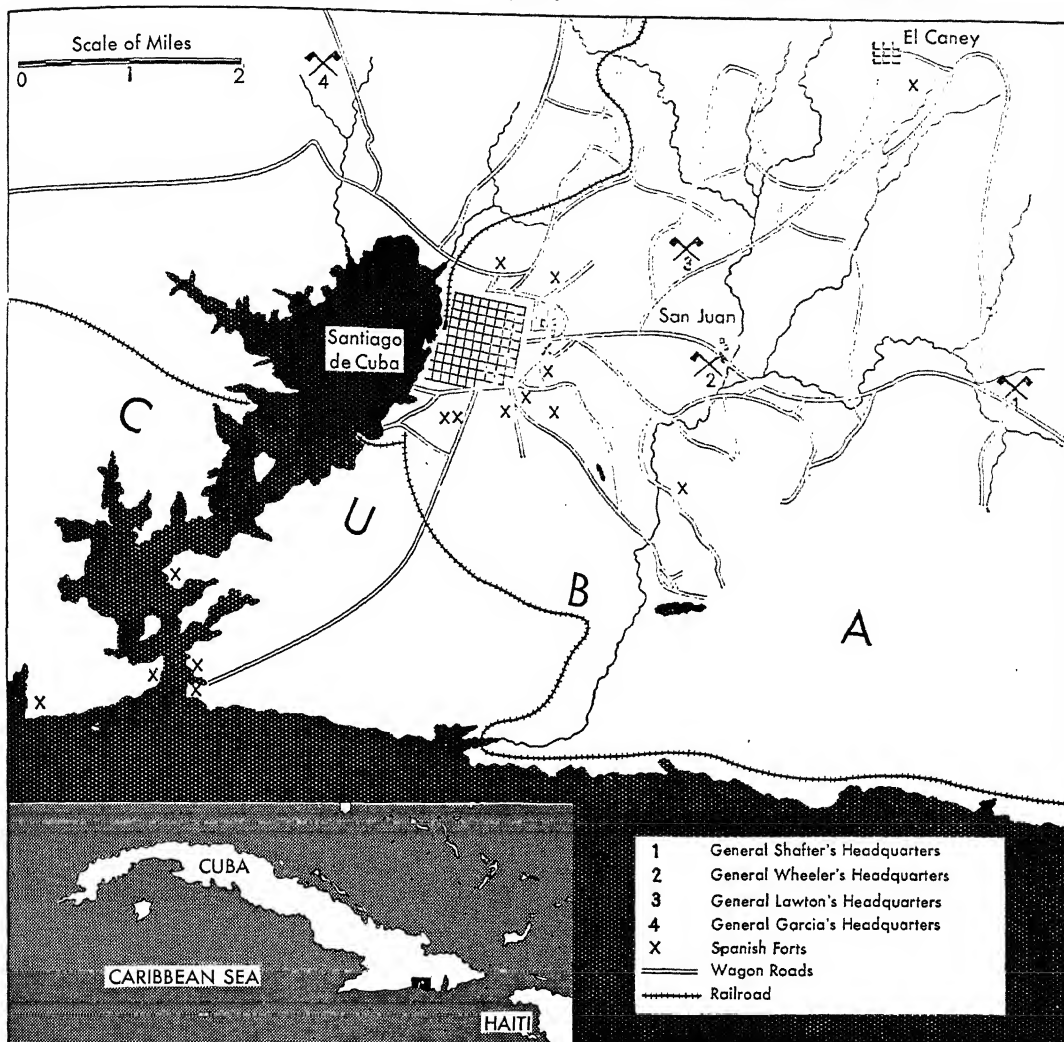
The business depression of 1894 made conditions in Cuba worse than ever. In 1895 the Cubans began a new war for independence. The Spanish governor, Valeriano Weyler y Nicolau, used every cruel means to crush the revolt. Cuban women and children suffered in concentration camps, and many died of starvation. The Cuban rebels fought back by destroying cane fields and sugar mills owned by the Spanish.

Some American newspapers printed sensational stories on conditions in Cuba. Many reports exaggerated Spanish cruelty. American public opinion flared up against the Spanish. Many persons demanded that the United States help the rebels in their fight for independence. Leading political figures, including Assistant



Joseph Boggs Beale, Modern Enterprise

**The Landing of United States Troops in Cuba** during the Spanish-American War is shown in this painting by Joseph Boggs Beale. The fighting men are American Marines.



**The Chief Campaign of the Spanish-American War** was fought both at sea and on land in the area shown in the detailed map above. The Americans defeated the Spaniards at El Caney and San Juan, and finally forced their surrender at Santiago.

Secretary of the Navy Theodore Roosevelt and Senator Henry Cabot Lodge, clamored for war against Spain. They wanted to strengthen the United States by taking over Spanish islands in the Caribbean and the Pacific.

President William McKinley hoped to avoid any trouble with Spain, and offered to help Spain and the rebels reach an agreement. Late in 1897 Spain removed General Weyler from Cuba and promised to give the colony some form of self-government. But just when the situation seemed to be improving, the American warship *Maine*, on a friendly visit to Cuba, exploded and sank in the harbor at Havana. The cause of the ship's destruction was never learned. Many Americans blamed the Spanish for sinking the ship. The slogan "Remember the *Maine*" became popular among persons who wanted war with Spain.

Spain offered to submit the *Maine* question to arbitration, and Spanish authorities ordered an end to the

fighting in Cuba. But the United States Government demanded a free and independent Cuba, and Congress gave the President authority to use the army and navy to drive Spanish forces and officials from the island. Spain at once sent home the American minister. The United States Congress declared that war existed as of April 21.

**Chief Events.** Two days before war actually broke out, American ships began a blockade of Havana and the northern coast of Cuba. At the same time, American Commodore George Dewey brought his fleet to the Philippines, which was then a Spanish possession. The first important engagement of the war was fought at Manila Bay. Dewey destroyed the Spanish fleet at Manila, and American ground troops entered Manila on August 13.

Meanwhile, a Spanish fleet under the command of Admiral Pascual Cervera y Topete anchored in Santi-



ago harbor on the southern coast of Cuba. These ships were nearly all that remained of Spain's navy. The United States North Atlantic fleet took a position outside the harbor of Santiago. At the same time, American troops under Major General W. R. Shafter landed a few miles east of Santiago. The American plan was to catch the Spanish fleet between ground forces and naval vessels.

On July 1, American troops defeated the Spanish at the battles of San Juan Hill and El Caney. These battles were marked by the daring deeds of the famous Roughriders, a regiment under the command of Colonel Leonard Wood and Lieutenant Colonel Theodore Roosevelt. Admiral Cervera received orders to run through the American blockade and save his ships. His vessels steamed out of Santiago harbor on July 3, but all of them were sunk or beached in the fight with the United States Navy.

One of the American warships which took part in the battle of Santiago was the *Oregon*, commanded by Captain Charles Edgar Clark. Clark had brought his vessel around Cape Horn from San Francisco in order to strengthen the North Atlantic fleet.

On July 16, Spain surrendered Santiago to the United States Army. On July 25, General Nelson Appleton Miles occupied the Spanish island of Puerto Rico. Through the French ambassador in Washington, the Spanish government now asked for peace. Hostilities ended on August 12, and a peace treaty was signed in Paris on December 10, 1898.

**The Peace Treaty.** The Treaty of Paris made Cuba free and gave the United States the Spanish possessions of Puerto Rico, the Philippines, and Guam. The United States paid Spain \$20,000,000 for public property in the Philippines. The United States managed the government of Cuba until decent living conditions could be set up in the island. Thus Spain lost its colonial possessions, and the United States became a colonial power.

Many persons in the United States did not like their country's new position as a colonial power. These people called themselves "anti-imperialists." They objected especially to American ownership of the Philippines. They argued that the Filipinos did not want to be governed by any foreign country. But many other persons in America claimed it was the duty of the United States to bring civilization and Christianity to the Philippines. They declared that the Philippines were necessary for the expansion of American trade in the Far East. After much debate, the United States Senate approved the peace treaty by only one vote on February 6, 1899.

**Results of the War.** Victory over Spain gave the United States complete control of the Caribbean Sea. Guam and the Philippines, with Hawaii (which also was annexed in 1898), gave the United States "stepping-stones" across the Pacific, and the opportunity to take a leading part in the affairs of the Far East.

The Spanish-American War, and especially the voyage of the *Oregon*, showed the need for a canal through the isthmus which separated the Caribbean from the Pacific. Within a few years, the United States began building the Panama Canal. The United States also

found that it needed a larger navy in order to defend its new island possessions. A great shipbuilding program began, and the United States navy soon grew to be second in size only to that of Great Britain. With its new possessions and its great navy, the United States for the first time became a world power. J.W.P.

**Related Subjects.** The reader is also referred to:

Cuba	Philippine Islands
Dewey, George	Puerto Rico
Evans, Robley D.	Roosevelt, Theodore
Hobson, Richmond P.	Roughriders
McKinley, William	Sampson, William T.
(Administration as President)	Schley, Winfield Scott
Maine, The	Shafter, William Rufus
Paris, Treaties of	Sigsbee, Charles Dwight
Pershing, John J.	Spanish War Veterans, United
	Wood, Leonard

**SPANISH ARMADA, BATTLE OF THE.** See ARMADA; BATTLES, FIFTEEN DECISIVE.

**SPANISH BAYONET** is the name of a low, slender yucca tree which grows in the southern United States and in Mexico and the West Indies. It may grow to about twenty-five feet but usually is much smaller. It has long, flat, bayonetlike leaves, two and one half feet long and two to three inches wide. It bears cream-white flowers, sometimes tinted green or purple. They are about two and one-half inches wide. Several subspecies have leaves with yellow margins or centers. The many flowers, shaped somewhat like deep bowls, are borne on erect branched stems about two feet long. The Spanish bayonet may be grown from seeds or from the cuttings of either roots or stems. They grow best in the open, in sandy, well-drained soil. E.C.J.

**Classification.** The Spanish bayonet is classified as *Yucca aloifolia* in the plant family *Liliaceae*.

**SPANISH CIVIL WAR.** See FRANCO, FRANCISCO; SPAIN (History).

**SPANISH GUINEA** is a colony of Spain on the western coast of Africa and in the Gulf of Guinea close to the equator. The colony covers a total area of 10,852 square miles, and has a population of 167,500. Spanish Guinea is composed of an area on the mainland called Continental Guinea or Rio Muni (10,040 square miles), the four small islands of Annobon, Corisco, Great Elobey, and Little Elobey, and the larger island of Fernando Poo. Santa Isabel, on Fernando Poo, is the capital of Spanish Guinea.

Continental Spanish Guinea is heavily covered by a wet tropical forest where native Negro tribes live. Most of the natives belong to the Fang tribe. They engage in a primitive kind of farming. They clear the land by fire and plant crops in holes made in the ground with sticks. When the bushes and weeds become too thick, the natives move to another location in the forest.

Fernando Poo is a volcanic island. The Bube tribe occupies the inland areas of the island and lives by hunting and collecting wild fruits and nuts. The coastal dwellers include a few Europeans, but are mostly a mixture of Negro tribes descended from slaves. English is commonly spoken by these people because the British navy was based on Santa Isabel (then called Port Clarence) from 1827 to 1844 in order to attack slave ships.

The trade of Spanish Guinea is almost entirely with Spain. The chief exports include cocoa, coffee, tropical vegetables and fruits, and tropical woods. Mineral de-

posits, including gold, have been reported in the highlands of continental Guinea.

H.V.B.K., Jr.

**SPANISH INQUISITION.** See INQUISITION.

**SPANISH LANGUAGE.** Spanish is one of the four Italic branches of the Indo-European languages. The Romanic, or Italic, languages came from the Latin speech and dialects of Rome. But long contact with Arab culture and the Arabic language influenced the Spanish tongue, especially its vocabulary.

The Arabs invaded Spain in 711. The last stronghold of the Arabs, Granada, was not captured until 1492. Many Spanish words are not Latin in origin, but Arabic. A few words came from the Germanic tribes, such as the Goths, which invaded Spain. Spanish grammar and pronunciation are very regular, and Spanish is one of the easiest languages to learn.

Castilian is the official language of Spain, and is the chief literary language. But excellent works have been written in Catalan, which is spoken in Catalonia, and Galician, spoken in Galicia. Many other dialects also are spoken in Spain. Among them are the Valencian, Leonese, and Aragonese. The Basque language of northern Spain and southwestern France is unlike any other language of the Indo-European family.

Today Spanish is the language of Mexico and Central and South America, except Brazil, as well as of Spain.

W.S.H.

See also ROMANCE LANGUAGE.

**SPANISH LITERATURE.** Spain has a rich and abundant literature. The early epic is best represented by the realistic *Poem of the Cid*, whose author is unknown. It deals with the national hero of Spain, the Cid. An important early name in Spanish literature is that of Alfonso el Sabio (1226?-1284). His court was the gathering place of artists, writers, scholars, painters, and musicians. The translation and popularization of literature of all kinds was carried on by Arabic, Jewish, and Christian scholars. Much of this writing was organized into encyclopedia form.

*The Book of Good Love* (*Libro de buen amor*) appeared early in the 1300's. It was by the archpriest of Hita, Juan Ruiz, and it dealt with sensual and divine love. It also contained beautiful prayers to the Virgin and songs for Moorish dancing girls. The humor of the book adds to the enjoyment of this great medieval work. Another book of great merit is *The Celestina* (1499). A romantic plot with lifelike characters serves as the background for this dramatic novel. The character portrayal of the old hag, Celestina, is one of the best in literature.

**The Golden Age** (1550-1680). This is the period of great literary development in the novel, drama, poetry; and the ballad. The *picaresque novel*, begun by *Lazarillo de Tormes* (about 1554), had a great influence in Europe. There were many of these novels, and they were a contrast to the novels of chivalry, which were modeled on the *Amadís de Gaula*. Spanish ballads began to be printed in the early part of the Golden Age. Nearly everyone knew many ballads by heart. The ballads became the inspiration for plays, and were also very popular when they appeared in other literary forms, such as novels, stories, or dramas. Cervantes quotes some of them. He is the author of the famous *Don Quixote*.



From *Don Quixote of the Mancha*, retold by Judge Parry and illustrated by Walter Crane. Dodd, Mead and Co.

**The Confused Knight, Don Quixote**, puts his makeshift helmet on a dummy and tests it with a blow of his sword.

Cervantes is considered the greatest writer in all Spanish literature, and one of the greatest in world literature. See CERVANTES SAAVEDRA, MIGUEL DE; DON QUIXOTE.

The typically Spanish national drama was developed in this period. Lope de Vega, Tirso de Molina, and Calderón de la Barca each wrote hundreds of plays. Many others, including Ruiz de Alarcón, Guillén de Castro, and Mira de Amescua, wrote fewer dramatic pieces. One of the characters of Tirso de Molina's *El burlador de Sevilla* is Don Juan.

The mystics flourished after about 1550. Santa Teresa, San Juan de la Cruz, and Luis de León were among them. One of Spain's greatest satirists was Francisco de Quevedo y Villegas (1580-1645), who was also a novelist, critic, and poet. Luis de Góngora y Argote (1561-1627), was one of Spain's more famous poets.

**Nineteenth and Twentieth Centuries.** The recent literature of Spain has tended to follow the pattern of world literature. Romanticism began to flourish in Spain about 1830, and it was expressed most effectively in drama and poetry. García Gutiérrez wrote *El Trovador* (1836). This was the source of Verdi's *Il Trovatore*. The Duque de Rivas wrote *Don Alvaro* (1835), the source of Verdi's opera *La forza del destino*. Espronceda wrote the celebrated *Estudiante de Salamanca*.

About the middle of the 1800's began the period of realism. Pérez Galdós, Pardo Bazán, and Palacio Valdés were among such writers. The best known is Blasco-

Ibáñez, whose *The Cabin*, *The Four Horsemen of the Apocalypse*, and *Mare Nostrum* have been widely read.

Some of the best Spanish lyrical poetry and good prose in the early 1900's came from Spanish America. Spanish-American poets were among the first to feel the influence of modernism and of the French poets. The great Spanish poets later caught this quality in their work. Spanish literature then followed the trend of modernism. The drama, the novel, and the philosophical and political essay became important.

Among the works dealing with social problems are the plays of Jacinto Benavente, a Nobel prize winner. One of his best is *Los Intereses Creados*. Pío Baroja, Ramón del Valle Inclán, and Ramon Perez de Ayala are notable novelists. Miguel de Unamuno and Ortega y Gasset are the best-known essayists. Gasset's *The Revolt of the Masses* has been widely circulated in the United States.

After World War I the many social and political revolutions, especially among Spanish-speaking peoples, had much effect upon Spanish literature, especially in the New World. In the 1920's there was a generation rich in realistic and revolutionary poets, novelists, and historians. The literary production of Spanish America is large and excellent. W.S.H.

See also BENAVENTE Y MARTÍNEZ, JACINTO; BLASCO-IBÁÑEZ, VICENTE; CID, THE; UNAMUNO Y JUGO, MIGUEL DE; VEGA, LOPE DE.

**SPANISH MAIN** was the name English buccaneers, or pirates, gave to the northern coast of South America. By 1500, Spain was in control of the Caribbean Sea, the West Indies, and large areas of the South American mainland. *Spanish Mainland* referred to what are now Colombia and Venezuela. English seamen shortened the name to *Spanish Main*. Later the name was often used for the whole Caribbean Sea. See also CARIBBEAN SEA. M.F.L.

**SPANISH MISSIONS IN CALIFORNIA.** See CALIFORNIA (Education; Religion; Arts and Crafts).

**SPANISH MOSS** is a graceful herb which hangs low from trees in the southern United States and tropical America. It is not a moss although it looks somewhat like one. Its beauty has been mentioned by many southern writers. Spanish moss has many long slender moss-like stems which bear many small leaves and tiny yellow flowers. The stems sometimes grow to a length of twenty feet. It is used as a packing and stuffing material, especially in manufacturing mattresses. P.C.S.

See also AIR PLANT.

**Classification.** Spanish moss is classed as *Tillandsia usneoides* in the family Bromeliaceae.

**SPANISH SUCCESSION, WAR OF THE.** See SUCCESSION WARS.

**SPANISH WAR VETERANS, UNITED.** This organization was founded in 1898 by some of the men who took part in the Spanish-American War. The United Spanish War Veterans has 80,000 members in local groups throughout the United States and its possessions. The organization works to gain government benefits for its members, and to help needy veterans and their families. It has headquarters in Washington, D.C.

**SPAR BUOY.** See BUOY.

**SPARK COIL.** See AUTOMOBILE (Parts [Engine]).

**SPARK PLUG.** See AUTOMOBILE (Parts [Engine]).

**SPARKS, JARED** (1789-1866), was an American historian and biographer. He was a pioneer in collecting original documents relating to American history. One of his best-known works is his twelve-volume edition of the *Writings of George Washington*. This work is a famous example of "hero-worship" scholarship. In his editing, Sparks often omitted passages that he thought might show Washington in a bad light, and he corrected all Washington's errors in spelling and grammar. But in spite of his methods Sparks did much to advance the study of American history.

Sparks was born in Willington, Conn., and studied at Philips Exeter Academy and Harvard College. Later he became a minister of the Unitarian Church, but resigned in 1823. From 1824 to 1831 he was editor of the *North American Review*. In 1839 he was appointed professor of history at Harvard, and ten years later became its president. M.C.

**His Works** include *The Library of American Biography* and *The Works of Benjamin Franklin*.

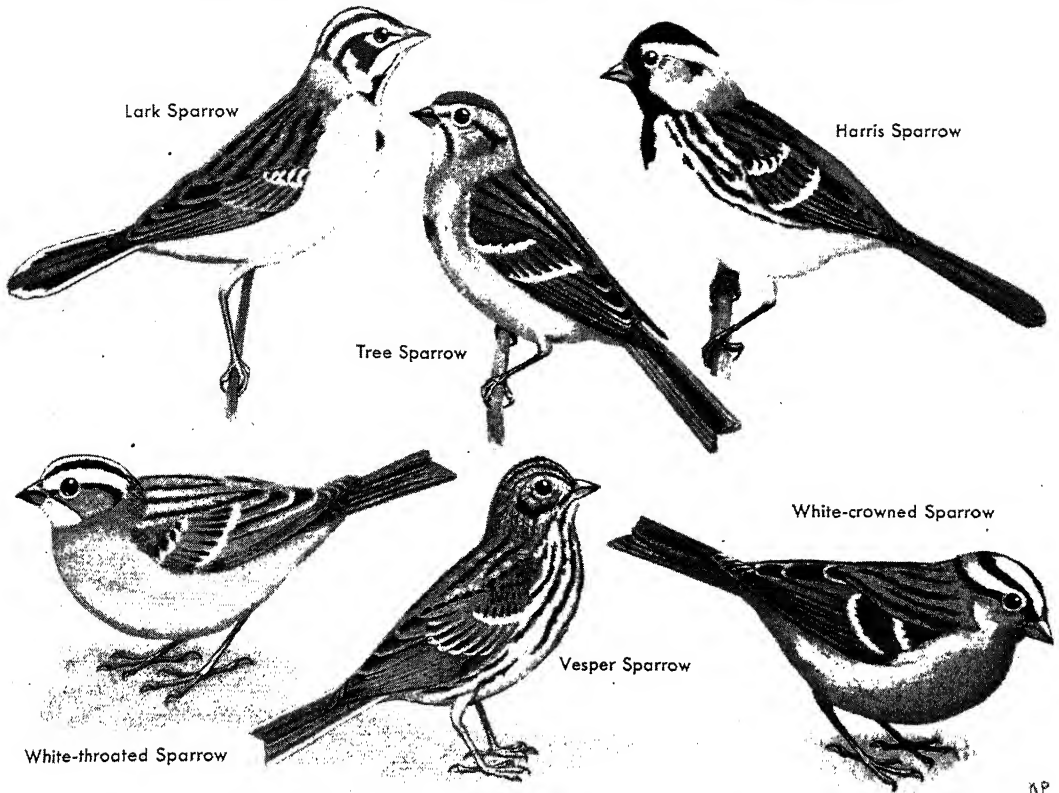
**SPARROW.** The sparrow is a small plain-looking song bird with a cone-shaped bill. Sparrows live in most parts of the world except Australia. They are great eaters of seeds, which they shell before eating. Most sparrows fly to warmer climates in cold weather. Those which nest in the northern United States and Canada spend the winter in the Gulf states.

One of the best-loved American sparrows is the *song sparrow*, which sings in a high, clear trill. Other favorites are the *vesper sparrow*, which has a sweet plaintive note, and the beautiful *white-throated* and *white-crowned sparrows*. The largest are the *fox sparrow* and the *Harris sparrow*. The Harris sparrow has black splashed about its head and breast. The *tree sparrow*, or *winter chippy*, the *clipping sparrow*, and the *field sparrow*



De Palma, Black Star

**The Spanish Moss Is Known as an Air Plant** because it lives on trees, and does not have roots in the ground. The plant does not harm the tree but adds to its appearance by draping a beautiful lacy covering on the trunk and limbs.

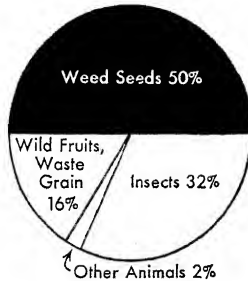


Six of the Well-known Native Sparrows. All Are Pert, Cheery Little Birds, and Excellent Musicians

are all marked with chestnut crowns. The medium-sized *grasshopper sparrow* has a large head. The field sparrow lives in dry pastures and on hillsides. The "chippy" is a familiar bird around lawns and gardens. The tree sparrow nests in the far north but winters in the United States and southern Canada.

One of the most common sparrows is the *English*, or *house sparrow*. It is found about houses and villages in most parts of the Old World, and was brought into the United States in the middle of the 1800's. The male has a striking black chin and throat in summer. This mask is partly hidden in winter by grey edges which appear on the feathers. The male has chestnut stripes on his head and shoulders.

The house sparrow has spread rapidly to all sections of the United States. It rears three or four broods of young in a season. The sparrow makes its nest in any cranny it can find, and builds with any material it can find. It is a pest around buildings, especially in eaves, troughs and drains, which it sometimes stops up with its nest. The house sparrow lays from five to seven eggs, usually white and marked with yellowish green.



Food of the Sparrow

Some authorities say that the English sparrow is helpful to man because it destroys the seeds of troublesome plants. But most persons think we would be better off without the noisy little bird if we could have the bird neighbors it has chased away.

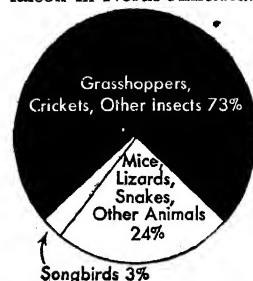
A.A.A.

See also BIRD (Kinds of Nests; Eggs; color plate, Birds That Help the Farmer).

**Classification.** The English sparrow belongs to the *Ploceidae* family. The others are in the family *Fringillidae*. The song sparrow is *Melospiza melodia*. The vesper sparrow is *Poocetes gramineus*. The white-throated sparrow is *Zonotrichia leucophrys*. The Harris sparrow is *Z. querula*, and the fox sparrow is *Passerella iliaca*. The tree sparrow is *Spizella arborea*, the chipping sparrow is *S. passerina*, and the field sparrow is *S. pusilla*.

**SPARROW HAWK.** The sparrow hawk is the smallest falcon in North America. It is a bird of prey, or one

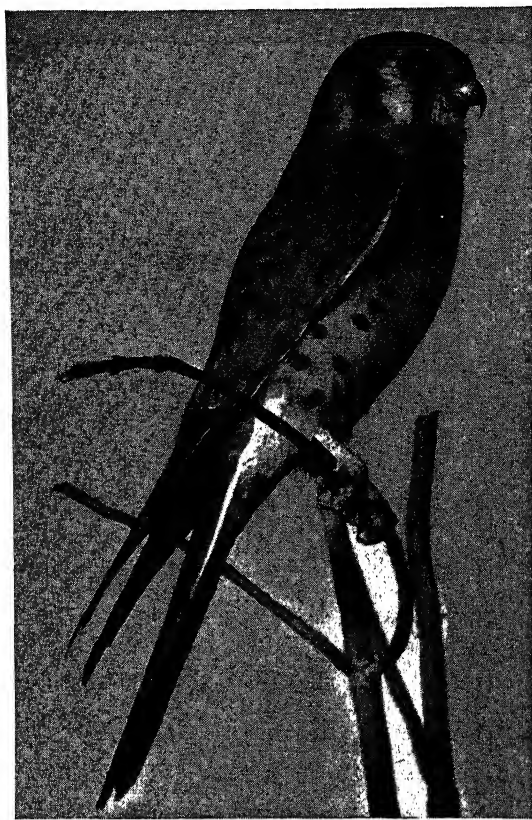
which eats living animals. It is different in size, appearance, and habits from the so-called sparrow hawk of the Old World, which resembles the American Cooper's hawk. The sparrow hawk breeds from northern Canada to northern Mexico. It winters mainly in the southern United States and south to



Food of the Sparrow Hawk

Panama. The male has a reddish-brown back with black bars, a plain reddish-brown tail tipped with a band of black and white, and bluish-gray wings spotted with black. The female has back, tail, and wings entirely dull reddish brown and narrowly barred with black throughout. It eats insects, small rodents, reptiles, and sometimes smaller birds. It is about the size of a mourning dove, but has a larger tail. The female sparrow hawk lays from five to seven creamy-white to reddish eggs. See also BIRD (color plate, Birds of Prey); FALCON AND FALCONRY. O.S.P., JR.

**Classification.** The North American sparrow hawk is classed as *Falco sparverius* in the *Falconidae* family. The European sparrow hawk is *Accipiter nisus* in the *Accipitridae* family.



George M. Brant

**The Little Sparrow Hawk** is only slightly larger than a robin. It is a swift, darting flier, and is valuable to man because it eats rodents and destructive insects.

**SPARS.** Members of the Women's Reserve of the United States Coast Guard were popularly called SPARS. The name *Spar* is taken from the first letters of the Coast Guard Latin motto and its translation, *Semper Paratus* (Always Ready). The Reserve was created on November 23, 1942. There were 10,000 SPARS on duty in August, 1945. Recruit training was given at Palm Beach, Fla., and later at Manhattan Beach, N.Y. After instruction at training stations, SPARS were assigned to such duties as those of yeomen, storekeepers, radio operators, ship's cooks, and pharmacist's mates. In 1945, SPARS were allowed to serve overseas within the

Western Hemisphere. Many women served in Hawaii and Alaska.

SPARS wore a navy blue skirt and jacket, with the metal seal of the Coast Guard on their lapels. Enlisted SPARS wore the Coast Guard shield in white on their sleeve. Officers wore a gold shield. A band on the hat was lettered U.S. Coast Guard. The highest officer in the SPARS held the rank of captain. Only one officer was allowed to hold this grade.

All SPAR enlistments and training were discontinued in September, 1945. The organization was officially dissolved on May 26, 1946.

See also STRATTON, DOROTHY CONSTANCE.

**SPARTA**, the capital of Laconia, was at one time the most powerful city state of ancient Greece. It was famous for its military power and its loyal soldiers. The greatest honor that could come to a Spartan was to die in defense of his country. Endurance, a scorn of luxuries, and unyielding firmness are still spoken of as Spartan virtues.

**The Land.** Sparta was situated in a lovely, sheltered valley on the bank of the Eurotas River. It was protected on all sides by mountains. The climate was mild, and the soil was fertile and well watered. Sparta had few mineral resources. Marble and a little iron were obtained from near Mount Taygetus.

**The People.** The Spartans were descended from the Dorians, a people who invaded the Greek peninsula about 1000 B.C. (see DORIAN). They enslaved the earlier Greek peoples of Laconia. (See ACHAEAN, IONIAN.) The enslaved Greeks, called *Helots*, outnumbered the Spartans by perhaps as much as twenty to one.

Some of the non-Spartan Greeks escaped enslavement. They were not citizens, but they lived in Sparta as free men. This group was known as the *Perioeci*.

There were thus three kinds of people in Sparta, all Greeks. The numbers varied widely during Sparta's long history. Some authorities estimate that at the height of Spartan power there were about 25,000 Spartan citizens, an unknown number of *Perioeci*, and as many as 500,000 *Helots*.

**Ways of Life.** The Spartan citizen could engage in no industry but agriculture. A few aristocrats owned their land, but most citizens held state-owned plots. The *Helots* farmed the soil, and each was required to give a fixed amount of produce to his master. The rest — often very little — went to the *Helot* himself.

The *Helots* bitterly resented their lot, and revolts were not unusual. Once a year the Spartans officially declared war on the *Helots*, so that they could kill any who seemed rebellious without breaking the law against murder.

A citizen who could not make enough from his estate to support his family and pay the taxes lost his land to someone who could make it pay. He also lost his citizenship. It was therefore dangerous to try to rear a large family. Unwanted children were cast into a deep cavern in the mountains and left to die.

Since citizens were not allowed to carry on manufacturing or trade, these pursuits were taken over by the *Perioeci*, some of whom grew wealthy.

Every Spartan belonged to the state from the time of his birth. A boy was left to the care of his mother until



## SPARTA

he was seven years of age, when he was enrolled in a company of fifteen members, all of whom were kept under the strictest discipline. From the age of seven, every Spartan had to take all his meals with his particular company in a public dining hall. The bravest boy in a company was made captain. The others obeyed his commands and bore such punishments as he decided they should have.

When the boys were twelve, their undergarments were taken away and only one outer garment a year was allowed them. Their beds consisted of the tops of reeds, which they gathered with their own hands and without knives. The arts of reading and writing were not considered necessary. Boys learned the *Iliad* and songs of war and religion, but leaping, running, wrestling, and wielding a weapon with grace and accuracy were considered much more important. Between the ages of twenty and thirty Spartan youths served as cadets, who policed the country, kept the Helots in order, and exacted disciplined obedience from the enslaved people.

At the age of thirty, a Spartan attained full maturity and enjoyed the rights and duties of citizenship. He might live at home, attend meetings of the assembly, and hold public office. At the age of sixty his military career ended. After that he was employed either in public affairs or in the training of the young.

As a result of this system, the Spartans became tough, proud, disciplined, noted for obstinate conservatism and for brevity and directness of speech. From childhood, life was one continued trial of endurance. All the gentler feelings were suppressed.

Spartan women, on the other hand, lived the freest life of any women in Greece. As girls, they engaged in athletics, and as women were mistresses of their own households. They engaged in business, and many became wealthy and influential. Aristotle tells us that women owned two fifths of the land in Sparta.

**History.** The Dorians who settled in Sparta extended their control over all of Laconia at an early date. In 743 B.C. they conquered Messenia, the rich farming region beyond Mount Taygetus to the west. Sparta failed to conquer the cities of Arcadia, but compelled them to enter the Peloponnesian League. The members of the League were obliged to follow Sparta in war. By the middle of the 500's B.C. this league included most of the cities in southern and central Greece.

Sparta conquered Athens, the leader of the powerful Athenian Empire, in the hard-fought Peloponnesian War. In 404 B.C. the Athenians were forced to accept a humiliating peace treaty. But the leadership won by Sparta was short-lived. So cruelly did the Spartans rule over the other Greek states that they revolted and threw off the Spartan yoke. At the battle of Leuctra, in 371 B.C., Sparta lost forever its claim to supremacy in Greece. But it remained a powerful city for the next 200 years. In 146 B.C. it passed with the rest of Greece under the rule of Rome.

There is a modern town of Sparta near the site of the ancient city. It was laid out about 1835 and made the capital of the modern political division of Laconia. Excavations have been made on the old site, and much valuable material has been discovered from the early periods of the city's history.

C.B.W.

## SPASM

**Related Subjects.** The reader is also referred to:

Athens	Laconia
Dorian	Leonidas I
Education (Ancient Greek	Lycurgus
Education)	Peloponnesian War
Helot	

**SPARTACUS** (? -71 B.C.), was the most famous of all Roman gladiators. He won his fame not in the arena, but rather as the leader of a great slave uprising.

Spartacus was born in Thrace, and was a shepherd in his youth. Later, while serving as a soldier, he was captured by the Romans, and was sold as a slave to a training school for gladiators in Capua. Spartacus escaped with seventy comrades and hid on Mount Vesuvius. There he gathered an army of runaway slaves and held off several Roman forces which had come to recapture them.

When his army was large enough, Spartacus left the mountains and conquered most of southern Italy. Two Roman armies were sent against him, but his forces defeated them. Spartacus wanted to lead his men over the Alps and out of Italy so that they could return to their homes. But the slaves wanted to march on Rome and begged Spartacus to lead them. When the time came, they lost their courage and turned back.

A fresh army under Marcus Licinius Crassus was sent against Spartacus. The gladiator was at first successful, but his followers began to fight among themselves, and were finally defeated by the Romans. Spartacus himself fought with great courage until he was killed. W.S.F.

See also **CRASSUS, MARCUS LICINIUS; GLADIATOR.**

**SPARTANBURG, S.C.** (population 32,249), is an important cotton-textile-manufacturing city. It is also the trading center of a fertile peach-orchard region. Spartanburg lies in northwestern South Carolina, about fifteen miles from the North Carolina border. The city is surrounded by mill villages containing more than forty cotton-spinning plants. There are two textile mills in the city itself. Spartanburg is the home of Wofford College and Converse College (for girls). The site of Spartanburg was chosen as the county seat of Spartanburg County in 1785. Both county and town were named for the Spartan Regiment, a South Carolina militia group which fought in the Battle of Cowpens (1781) during the Revolutionary War.

R.L.Me.

**SPASM.** A spasm is a sudden contraction, or drawing together, of a muscle or group of muscles. It takes place involuntarily. Spasms occur most often in children and babies. They consist of a sharp jerking or twitching of the arm, leg, or some other part of the body. They are usually symptoms of a disorder or disease such as epilepsy. They are a common symptom of children who suffer from intestinal trouble. Spasms also occur in many cases of poisoning. They are a late symptom of Bright's disease. Spasms are sometimes called "fits."

A child or infant that has a spasm should be kept perfectly quiet. Ice should be applied to the head and the feet should be placed in a mustard bath. The rest of the body should be rolled in large towels that have been dipped in mustard water. The mustard water should contain two heaping tablespoons of mustard to one quart of lukewarm water. If the pulse is weak, the face pale, the nails and lips blue, and the feet and hands cold, the patient should be given a hot-water bath. This

water should not be over 106° F. and should be tested by a thermometer. The purpose of the hot-water bath is to bring the blood to the surface of the skin and draw off the blood from the heart, lungs, and brain. P.R.C.

**SPASTIC PARALYSIS** is a disease of the brain or spinal chord, or injury to them, resulting in lack of control over the muscles. It is also called *cerebral palsy*. In spastic paralysis the muscles in the affected part lack co-ordination and opposing muscles, like biceps and triceps, often tighten at the same time. The most common causes of spastic paralysis are brain injuries during birth or in an accident, sleeping sickness, and meningitis.

Spastic paralysis is an important problem in the education of children whose brains were injured at birth. The treatment aims at training another part of the brain to take over the duties of the damaged cells. Exercise and massage help the victim to relax. Patient teaching will in time enable the patient to co-ordinate his muscle movements. Sometimes surgery of muscles, tendons, or nerves will correct the condition. Many apparently hopeless victims of this disease have been taught to lead useful lives. A.B.H.

**SPATHE**, *spayth*. See ARUM.

**SPAVIN**, *SPAV in*, is a common name for two unrelated diseases which affect the hocks of horses. The hock is the ankle joint of the hind leg. *Bone spavin*, or true spavin, is a bony growth usually on the inner and lower part of the joint. It is caused by a lack of certain minerals in the bones. The joint may suffer from strain or concussion, which causes lameness. *Bog spavin* is a swelling of a capsule of tissue of the main joint. It is believed to exist in the horse at birth, and seldom causes any inconvenience.

Both diseases are seldom curable, and horses with spavin bring little money on the market. Bone spavin, however, can be treated to end lameness and to keep the growth from enlarging. C.R.F.

**SPAWN**. The eggs of fishes, mollusks, frogs, and other animals are called spawn, especially when they are found in masses. Usually such eggs are produced in great numbers, particularly by sea animals which are eaten by larger species, or which leave eggs and young to hatch and develop alone, with no parental care. These water animals must produce thousands or millions of eggs to keep from dying out. Some sea fish, such as the salmon, go up fresh-water streams during the spawning season. A few, like the eel, live in fresh waters but go down to the sea to spawn. The eggs of certain fish, particularly the sturgeon, are often used in making the delicacy known as *caviar*. The eggs of fishes are also called *roe*, particularly when used as human food. Shad roe is particularly favored. See also CAVIAR; FISH (Reproduction); SALMON; STURGEON. C.L.Hu.

**SPEAKER**. The presiding officer in the lower house of several national, state, and provincial legislatures has the title "Speaker." The nature of the office differs in different legislative bodies.

In the United States, the Speaker of the House of Representatives can wield great power. He is the recognized leader of his political party in the House, as well as the presiding officer. He is expected to use his office to promote the advantage of his party.

The early Speakers considered themselves simply as

presiding officers, and tried to be impartial. Henry Clay, elected Speaker in 1811, began the practice of using the office for party purposes. The office reached its height as a political force under the strong personalities of Thomas B. Reed, who served as speaker from 1889 to 1891 and again from 1895 to 1899, and Joseph G. Cannon, who was Speaker from 1903 to 1911.

For a time the Speaker was considered almost as important as the President. In 1910 he was removed from the Committee on Rules, and his control over the appointment of committees was taken away. But even with this reduced authority, the Speaker is important in national legislation. For the powers, duties, and methods of selection of the Speaker of the House, see REPRESENTATIVES, HOUSE OF.

In Great Britain a Speaker has presided over the House of Commons since at least 1377. The Speaker of Commons is a model of impartiality. He must make his rulings in line with the will of the majority of the House, but he never permits the minority to be abused. Each new speaker is elected by the House. It is the custom to re-elect the same Speaker in every succeeding Parliament until he dies or is ready to retire.

Great dignity is attached to the office. It carries a salary of 5,000 pounds (about \$20,000) a year, and an official residence in the Palace of Westminster. When the Speaker retires, he is made a peer, or nobleman.G.E.M.

See also MACE.

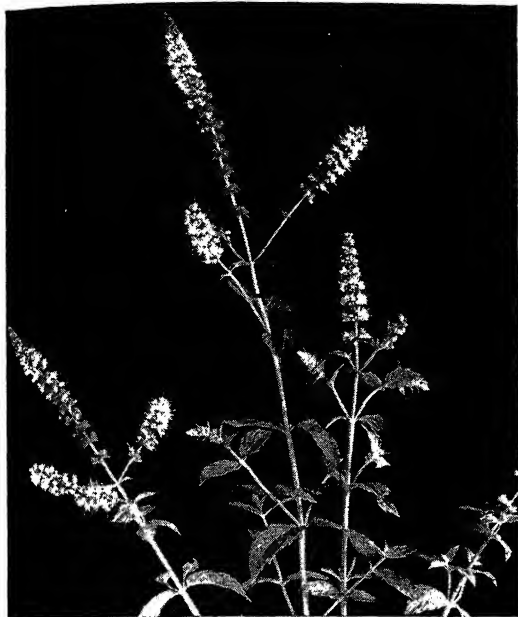
**SPEAR**. As a weapon of war, the spear has played an important part in history from earliest times. It was the chief weapon used in the battles of ancient Asia and Europe. The famous Greek poet, Homer, tells how Achilles speared Hector through the neck with a "pole heavy with bronze." The early Persians added a sharp spike to the back end of the spear so that both ends could be used. The Romans used a short, heavy spear called a *pilum*, and won many victories with it. The Gauls fought with a huge, clublike spear. Illyrian soldiers carried a fine, light javelin. In India soldiers mounted on charging horses threw the lance. The well-known British Bengal Lancers made a brilliant record with their skillful handling of the spear. The Bedouins of Arabia also were famous for their skill in using the lance on horseback.

Today the spear has been replaced by more deadly and mechanized weapons of war. It is now used chiefly in spear fishing. The spear is thrust below the surface of water which is clear enough to allow the spearman to see the fish. Spear fishing is popular among natives of the South Sea Islands. In the arctic regions, the Eskimo kill seals with spears and spear fish through holes in the ice. R.Cot.

See also JAVELIN.

**SPEARMINT** is a type of mint plant that grows in most of the temperate regions of the world. It yields an oil which is used in making perfumes, medicine, chewing gum, candies, julep, soup, and sauce. The plant has smooth, erect stems one or two feet high, with groups of pale purple or white flowers at the top. It furnishes the flavoring for mint julep and for the mint sauce or jelly which is eaten with lamb or mutton.

The world's center of spearmint-distilling is Saint Joseph County, Michigan. H.N.M.



L. W. Brownell

**Flowers and Leaves of the Spearmint Plant**

**Classification.** Spearmint belongs to the family *Lamiaceae* (or *Labiatae*). Its botanical name is *Mentha spicata*.

**SPECIAL DELIVERY.** See POST OFFICE DEPARTMENT (Postal Services).

**SPECIAL LIBRARIES ASSOCIATION.** This national organization was founded in 1909 to further the purposes of special libraries in business and industrial organizations. Its additional purpose was to promote the collection, organization, and spreading of information in specialized fields, and to develop usefulness and efficiency of special libraries and other research organizations. It undertook further to encourage the professional welfare of its members. The Association has 4,187 members in the United States and Canada and foreign countries. These members represent banking, advertising, insurance, finance, publishing, manufacturing, museums, specialized departments of colleges and universities, business branches of public libraries, and technical libraries.

The association has twenty-one chapters in the United States and two in Canada. An annual convention is held each year in June. The official journal, *Special Libraries*, is published monthly from September to April, and bimonthly from May to August. The association also carries on a professional publications program. The organization's program of assistance and advice to special libraries has expanded steadily since the Association was founded.

K.B.S.

**SPECIAL SESSION.** See CONGRESS OF THE UNITED STATES.

**SPECIE CIRCULAR.** See JACKSON, ANDREW (Surplus and the Specie Circular).

**SPECIE, *SPE shih ee*, PAYMENTS, RESUMPTION OF,** means the beginning of circulation of specie (metal coins), or "hard money," after it has not been used for a time. In the United States the use of specie, or coin, was

discontinued a number of times, and only paper money was circulated. The suspension was made chiefly by banks.

Suspension of specie payments by banks took place after the War of 1812 and in 1837, 1857, 1873, 1884, 1893, 1907, 1917, and 1933. The suspensions lasted from a few days to several years. The most important resumption of specie payments in United States history followed the War between the States. When that war broke out, the government was unable for legal reasons to sell enough bonds to finance its expenses. There also was a lack of income from taxes. The government then issued a large volume of United States Treasury notes, called *greenbacks*. These had to be accepted in all business transactions, and were thus circulated as money. By the end of the war, there were more than four hundred million dollars of such money in the country. Resumption of specie payment began January 1, 1879. The greenbacks then in circulation were paid out again. They were redeemable in gold from that time until 1933, when the United States Government abandoned the gold standard.

F.A.B.N.

See also MONEY (Monetary System of the U. S.)

**SPECIES, *SPE shiz*, or *SPE sheez*,** is the smallest important group used in the classification of plants and animals. All members of one species are alike in a number of essential particulars, and resemble a common ancestor. Several species may be included in a *genus*, and a species may in turn be divided into *varieties*, or *sub-species*. For example, all roses belong to the genus *Rosa*, which includes many different species, such as the meadow rose (*blanda*), and the prairie rose (*setigera*). See also CLASSIFICATION.

W.C.BEA.

**SPECIFICATION, *SPES ih fih KA shun*.** See ARCHITECTURE (How the Architect Works).

**SPECIFIC, *spe SIF ik*, GRAVITY.** See GRAVITY, SPECIFIC.

**SPECTACLED BEAR.** See BEAR (Kinds of Bears); SOUTH AMERICA (animal map).

**SPECTACLED COBRA.** See COBRA.

**SPECTACLES.** See GLASSES.

**SPECTATOR, THE.** See ADDISON, JOSEPH.

**SPECTRA,** the plural of SPECTRUM. See LIGHT (color plates); SPECTRUM AND SPECTRUM ANALYSIS.

**SPECTROHELIOGRAPH, *SPEK troh HE lih oh GRAF*.** See ASTRONOMY (Tools of the Astronomer).

**SPECTROSCOPE, *SPEK troh skohp*,** is an instrument used to study the spectra of bodies to determine their composition. The simplest form of spectroscope is a triangular glass prism. In a spectrum produced by a spectroscope of this sort, the colors overlap and tend to blend into each other. For the purpose of analysis, each color must be sharply defined. The spectroscope in general use accomplishes this. Light rays from the body to be analyzed pass through a narrow slit at one end of a *collimating tube* to a lens at the opposite end. The lens focuses each color to prevent overlapping. The focused light waves then pass through the prism and are viewed through the telescope.

Spectra of the heavenly bodies are obtained with a compound spectroscope. It consists of a series of prisms arranged in the arc of a circle. The spectrum is magnified by each prism in turn before it is viewed by the



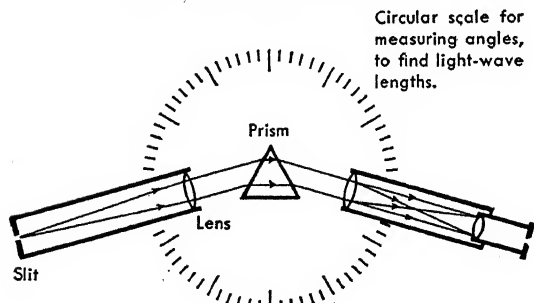
Bausch &amp; Lomb

Young Joseph Fraunhofer, Bavarian optician, explains the spectroscope he has invented to one of his friends.

observer. These spectroscopes can be attached to the eyepiece of a large telescope. They enable astronomers to measure distances and radial velocities of stars. As the body moves toward or away from the observer, the dark lines in the spectra move toward one or the other end of the spectrum. Astronomers have based some of their most remarkable discoveries upon this so-called Doppler principle.

A special spectroscope has been developed to determine the mass of an element and its isotopes. This spectroscope is known as a *mass spectroscope*. It was invented by the physicist Francis W. Aston in 1923. The mass

### THE SPECTROSCOPE — AN INSTRUMENT FOR SPECTRUM ANALYSIS



Circular scale for measuring angles, to find light-wave lengths.

Lens of collimator tube bends light rays from slit to parallel position before they reach the prism.

Telescope gives sharp image of spectrum, produced by prism. Hair lines can be focused on colors for wave-length readings.

spectroscope consists of a large magnetic field and an electrical field. This spectroscope is placed before an

element which has been separated into its i. passing it through a strong electric discharge. T trically charged rays which are given off by the material are bent, or deflected, by these two fields and shown on a fluorescent screen or photographed on a plate. These rays are analyzed to determine the mass of the atoms being studied.

M.Sc.

See also GEISSLER TUBE; PICKERING, EDWARD CHARLES AND WILLIAM HENRY; SPECTRUM AND SPECTRUM ANALYSIS.

**SPECTRUM, DIFFRACTION.** See DIFFRACTION.

**SPECTRUM AND SPECTRUM ANALYSIS.** If a beam of sunlight is passed through a specially cut glass called a prism, the beam separates into a band of seven colors. At one end of the band is red, followed by orange, yellow, green, blue, indigo, and violet, in that order. This band is known as a spectrum. It can be clearly seen in the rainbow. The spectrum is produced not only by sunlight, but also by any artificial light, such as an arc lamp, electric lamp, or ordinary gas flame. The type of spectrum that is produced by white light is called a *solar spectrum*. The best source of white light for study is the sun.

Why does a beam of white light separate into a band of colors when it strikes an interfering object? To understand this, we must first know that all light is transmitted, or carried, in waves. Light waves are of different lengths, and the length of each wave determines the color. For example, red is the longest light wave in the spectrum and violet is the shortest light wave. White light is actually a mixture of all the light waves in the spectrum. Why is it that the various light waves making up white light do not separate in the air? This is because all light waves, no matter what the wave length, travel through free space at the same speed. But when these waves strike a transparent object, such as glass or water, each light wave travels at its own speed. This causes each wave to bend and separate. The longer waves travel at a faster speed and the shorter waves travel at a slower speed. This means that red, which is the longest wave, travels fastest and is therefore bent the least by the interfering object. Violet, which is the shortest wave, travels slowest and is therefore bent or changed the most. It is this change in the rate of travel that causes the light waves to separate into their own colors and form a spectrum. This is called *dispersion*. The arrangement of these colors in the normal spectrum is always the same. The color plate shows the spectrum produced by a beam of white light when it is passed through a prism.

**Spectrum Analysis.** White light is not the only source of light that produces a spectrum. It has been found that when a substance is heated to a point where it turns into a gas, the substance will give off a light which produces its own spectrum. This radiation of light by a gas is best explained by the *quantum theory* of physics. When the element is heated to a higher temperature, the atoms begin to give off a light which has a certain spectral pattern. In general, this spectral pattern does not contain all the seven colors of the solar spectrum, but each element has its own colors. It is possible to identify an element by studying its spectrum, since no two elements have exactly the same spectral pattern. These

spectra are studied by a special device called a *spectroscope*. The study of spectra is known to science as *spectrum analysis*. Spectrum analysis has helped astronomers determine the composition of the sun, stars, and other heavenly bodies. It has also helped in the discovery of new elements and in the vast research program concerned with atomic energy.

In industry, spectrum analysis has been used to test how pure a substance is. It is claimed that if a substance has an impurity that is as small as  $\frac{1}{2,500,000}$  grain of lithium, it can be detected by a spectroscope. Spectrum analysis is also used in factories to control the purity of materials, to control the composition of alloys, and to identify elements and compounds.

**Types of Spectra.** There are three types of spectra which are produced by light, each type depending upon the source of the light. They are the continuous spectrum, the bright-line spectrum, and the absorption spectrum. The *continuous spectrum* is produced by light which comes from the sun, arc lamp, electric lamp, or ordinary gas flame. This type of spectrum has all the seven colors from red to violet. These colors are so blended together that there appears to be no division between any two colors.

The *bright-line spectrum* is produced when an element is heated to its gaseous state. This type of spectrum does not contain all the seven colors, but consists of bright lines of colors. For example, if some sodium chloride, or common table salt, is placed in the flame of a Bunsen burner the flame turns bright yellow from the melting of the sodium. If this flame were put before a spectroscope, it would contain one bright yellow line which is known to chemists as the sodium line. The color plate shows the spectral patterns of the elements iron, neon, and calcium.

The *absorption spectrum* is produced when there is an absorbing gas between the source of light and the spectroscope. For example, if an electric lamp is placed before a spectroscope, it produces a continuous spectrum. But, if a Bunsen burner containing melted sodium were placed between the lamp and the spectroscope, the spectrum would show all the colors but yellow. Instead of yellow there would be a dark line or group of lines. This is because the sodium absorbs the light wave which it would give off itself. In order to produce an absorption spectrum, the absorbing gas must always be cooler than the source of light.

**Fraunhofer Lines.** The dark lines found in the absorption spectrum are called *Fraunhofer lines*, named after the Bavarian optician who discovered them in 1841. These Fraunhofer lines are very important. They were first found in a beam of sunlight which was closely examined in a spectroscope. The German physicist Kirchhoff explained that these thin, dark lines were caused by the layer of gases surrounding the sun. These gases are cooler than the sun and absorb the light waves which they themselves would produce. The Fraunhofer lines made it possible to study the composition of the sun. They also showed that the earth and many of the stars are composed of the same elements. M.Sc.

See also COLOR; LIGHT (color plate); NEWTON, ISAAC, SIR; QUANTUM THEORY; RAINBOW; SPECTROSCOPE.

**SPECULAR IRON.** See HEMATITE.

**SPECULATION.** See BOARD OF TRADE (Speculative Trading).

**SPECULUM METAL.** See BRONZE.

**SPEECH** is a word that has several definitions. It may be used to mean the act of speaking, the result of speaking or what is spoken, the language of a particular nation or group of nations, or the dialect peculiar to a particular region or locality within a country.

The *act of speaking* includes the use of the audible code and the visible code. The *audible code* includes the sounds that are made by the speaker to produce words. The *visible code* includes the movements or gestures the speaker makes with his face, arms, and other parts of the body in order to emphasize his speech. There are many forms of the act of speaking. These include conversation, public speaking, debating, forum discussion, reading aloud, storytelling, and acting.

The *result of speaking* is the whole content and ideas expressed by the act of speaking. In a formal speech, this includes both the speech at the time it is given and its appearance in written or printed form.

The *language or dialect* definition of speech is one of the most complicated but interesting of the definitions. There are speech differences among the peoples of the various nations and groups of nations, and there are also many differences within countries. Different languages and different dialects of the same language are spoken in various sections of the same country.

In the United States, there are three distinct dialects of what we call American speech. These chief dialects are: (1) eastern (roughly covering the New England states and New York City); (2) southern (roughly the regions south of the Potomac and Ohio rivers [excepting West Virginia] east of the Mississippi River, most of Louisiana, and parts of Texas and Arkansas west of the Mississippi); and (3) general American dialect (roughly, the rest of the country).

Learning to speak properly is a most important accomplishment for everyone. The average child begins to learn to talk during his second year. He learns by imitating the speech of the people around him, so it is important that he hear proper speech. Parents should be quick to note any speech difficulties, such as lisping or stuttering, in their children. If such difficulties occur, parents should take the child to a competent authority on speech problems. There are a number of speech clinics throughout the country. W.H.Y.

See also CONVERSATION; DIALECT; HANDICAPPED, THE (Education of the Deaf); LANGUAGE; LISPING; PRONUNCIATION; PUBLIC SPEAKING; STAMMERING AND STUTTERING.

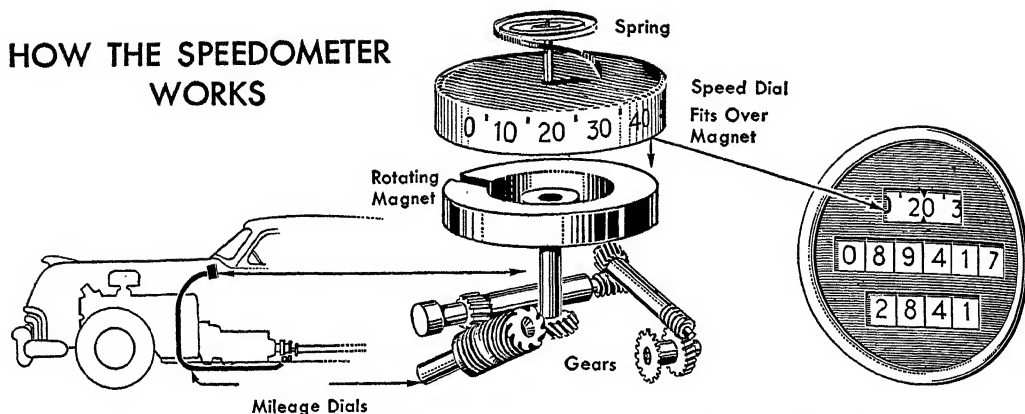
**SPEECH, FREEDOM OF.** See FREEDOM OF SPEECH.

**SPEED.** See ANIMAL (illustration, Comparative Speeds); AUTOMOBILE (Speed); BIRD (Speed and Distance of Flight); SPEEDOMETER.

**SPEEDOMETER, speed AHM ee ter.** The speedometer is a device used for telling how fast and how far a vehicle moves. The automobile speedometer consists of a cylindrical dial that bears numbers from 0 to usually 100, a spinning magnet that turns with a wheel of the car, and a flexible shaft that transmits the rotation taken from the wheel to the magnet. An armature is fixed to the cylindrical dial. It is held by a coiled spring



## HOW THE SPEEDOMETER WORKS



Gear mechanism of the speedometer is turned by a flexible shaft, or cable, connected to the drive shaft of the automobile. Speed of the device varies with that of the car.

Magnet spins as gears turn. Magnetic force created pulls the dial around against pressure of the spring. As the car moves faster, so does the magnet. The dial moves too, shows higher speed.

Other shafts connected to the gears turn the dials that register the car's total mileage and the mileage for a trip. Trip mileage can be reset to 0 by the driver.

in such a manner that when the magnet is not spinning the spring will return the dial to 0. As the magnet spins from motion of the wheels carrying the car forward, the

tance they have traveled is called a *cyclometer*. E.A.Fe. See also PEDOMETER.

**SPEEDWELL.** See FIGWORT FAMILY.

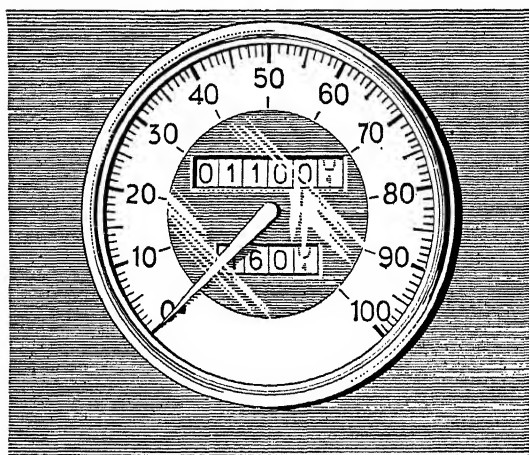
**SPEEDWRITING** is a substitute for shorthand. It is different from shorthand systems because it is based on the letters of the alphabet rather than on special symbols. In addition to letters of the alphabet, such marks of punctuation as commas, semicolons, slant lines, apostrophes, and dashes are used to stand for sounds. The Speedwriting student learns about 2,500 contractions and abbreviations for common words and phrases. Less common words are written according to a formal system of abbreviations for syllables. The sentence "The quick brown fox jumped over the lazy dog" would be written in Speedwriting as follows:

"t qk brwn fx jmpd v tlz, dg."

The main advantage to Speedwriting is that the student need not learn a new way of writing. He can take dictation in Speedwriting at the rate of about 120 words a minute after about two months of training. The main disadvantage to Speedwriting is that a very high speed of dictation, such as is possible in shorthand, is hard to attain. Speedwriting is now taught in many business colleges.

**SPEKE, *spek*, JOHN HANNING** (1827-1864), was a British explorer who discovered the source of the Nile River. He was born in Somerset, England. At the age of seventeen he became an infantry soldier in the Indian army. During the Crimean War he advanced to the rank of captain. Afterward Speke explored the Himalaya mountains and made three expeditions into Africa. On his second expedition his companion, Richard Burton, became ill, but Speke pushed on alone to discover Lake Victoria. In 1862 he proved that Lake Victoria was the source of the Nile by finding the point where the river emerges from the lake. His findings were not believed at first, but after his death other explorers proved that he had been right. The information Speke gave the explorer Samuel Baker helped Baker to find Lake Albert in 1864. See also VICTORIA, LAKE.

J. Cox.



**The Clocklike Hand of the Speedometer** shows the speed of the automobile in miles per hour. The upper narrow opening shows the total number of miles the vehicle has traveled. The lower one, which can be reset by hand to the 0-mile mark, shows the distance for shorter journeys, or trips. Because the speedometer measures distances up to 100,000 miles by tenths of a mile, it is a good way to visualize and study the decimal system of arithmetic.

armature on the dial attempts to follow the magnet, but it cannot do so completely, because it is held back by the spring. The faster the car wheels turn, the more impulses per second are imparted to the dial's armature, and the farther the dial swings over against the pull of the spring. Thus it registers higher and higher numbers as the car gains speed. Sometimes, instead of the numbered cylindrical dial, the armature is connected to a hand similar to a clock hand which points to numbers on a stationary circular dial to indicate the speed. A device used on bicycles to measure the dis-

**SPELLING**

**NIGHT  
AMONG**

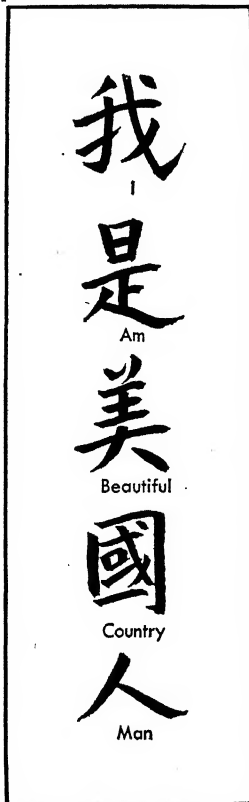
**SPOONFULS  
KIMONO  
IMPACT  
SEPARATE**

**SPELLING.** People usually *talk* to each other when they wish to gain information, get something, or share an idea or feeling with another. A hungry child speaks to his mother and asks for food. A baby may cry when he is frightened. This is communication by speech sounds. Speech has been the foremost method of communication as long as men have lived together in groups.

But sometime in the dim and distant past men found that they could communicate with one another by means other than the sound of the human voice. They found that they could draw pictures in the sand or carve figures on rock or wood. Other men who saw these pictures knew what the picturemaker meant.

But it was difficult to draw a picture for everything that men wished to say. Imagine how hard it would be to draw a picture that stood for "the sweet music of the evening breeze in the pines." One might figure out a set of pictures for these words, but it would take so much time that probably no one would try to communicate such a feeling. Probably no two persons who looked at the drawing would agree on what it meant. This limited what man could communicate to others by picture writing.

Later men learned to make marks that stood for certain ideas. For example, a cross might mean *danger* or an arrow might mean *go this way*. The Chinese developed a very complicated set of marks or symbols. They use a different character for each of thousands of different ideas. Each character stands for one word idea. Imagine how difficult it would be to learn enough Chinese characters to write



**These Chinese Symbols,** loosely translated, mean "I am an American."

"baseball practice will be held next Saturday at three o'clock in the vacant lot behind the church."

**Ideas and Words.** A more efficient system of passing on ideas and feelings became necessary as men grew wiser and learned great stores of knowledge. The population of the world grew larger and many men could not be present to hear the voice-made sounds of one man. Systems of alphabets were slowly developed through the ages. In the alphabet scheme, each sound made in speaking is represented by a certain mark, or *letter*. This system proved to be a simple method of written communication. There are only twenty-six letters in the entire English alphabet. A few other European alphabets have more letters.

The use of an alphabet made necessary a certain arrangement of letters to express a thought. Pronounce the short word that describes a wooden club used to hit the ball in baseball. Say the word again and listen carefully for the three sounds that flow together to make up the spoken word. Try to *write* the word instead of speaking it. First put down the letter which stands for the beginning sound of the word, *b*. Then write the letter which stands for the middle sound, *a*. Finally, write the letter which stands for the last sound in the word, *t*. The letters *b-a-t* repeat in the same order the three original sounds of the spoken word. This is the *spelling* of the word *bat*.

Spelling is simply the system of writing letters for spoken sounds. At first, it may seem very much more complicated than picture or character writing. But the system is really simple and is very useful after one has mastered the alphabet and knows how these letters are put together in different ways to represent the spoken sounds.

Several hundred thousand words can be spelled out of the twenty-six letters of the English alphabet. Compare such a language with the Chinese, in which more than forty thousand different characters or symbols are needed to write all the words in the language. Spelling is a highly useful tool even if it seems at times difficult to master.

**English Spelling.** There is a great difference in the ease with which the spelling of the various alphabet languages is learned. The English language is one of the most difficult to spell. Some languages have consistent spellings, and when a word is pronounced, one knows exactly how it is spelled. But this is not true with many words in the English language. For example, the last sound in the word *stiff* is an *ff* sound, which is written as *ph* in *graph* or as *gh* in *tough*. The final sound in all three words is the same. If English spelling were logical and consistent, the letters *ff* would be used to end all three words, which would be spelled *stiff*, *graff*, and *toiff* or *tuff*.

Another example of some of the strange forms in English spelling is the spoken word that means the *color of blood* and the spoken word that means *to have finished reading*. Both of these words are spoken just the same way. When they are spelled, the same letter, *r*, is used to begin the words, and the same letter, *d*, is used to end both words. But the letter *e* is used for the middle sound in spelling *red*, the color of blood, and the letters *ea* are used for the middle sound in spelling *read*, mean-

ing to have finished reading. There are many other such sounds in the words of the English language. Some of these include the words, *sleigh* and *slay*, *herd* and *heard*, *lam* and *lamb*. Words of this kind make it almost impossible to form any consistent and regular rules for spelling.

**Root Words.** The first problem in learning to spell is to decide which words are most important. There are several hundred thousand words in the English language alone. But the average person uses fewer than 25,000 different words in speaking. He uses even fewer in writing. About 2,000 root, or basic, words will satisfy over 90 per cent of all the writing needs of the average eighth-grade student. An additional 1,000 root words, or 3,000 in all, will take care of 95 per cent of all the writing needs of the average adult. An example of a root word is *world*. Other words that are taken from this root are *worldly*, *world-wide*, and *worldliness*. Anyone can learn to spell if he will learn these 3,000 root words and add to them any necessary words of a personal or technical nature.

Two main sources exist for determining which root words must be mastered in learning to spell. One is the writing of adults, and the other is the writing of children. Many of the same words are included in both groups. But there are enough differences to make it worth while to search the writings of each group separately. Millions of words written by each group have been listed and analyzed. Examples of such a word study are the words *about*, *absorb*, *abrupt*, and *abolitionist*. Research shows that the word *about* is used by both the adult group and the children's play group, as early as the first grade in school. The word *absorb* is used by the adult group but is not commonly used by children until they reach the eighth grade. *Abrupt* is often used by adults but is seldom used by children younger than high-school age. *Abolitionist* is not found at all in the list of words used by children and occurs only very rarely in adult usage.

Most good modern textbooks of spelling contain words from both kinds of research. Lists of such words aid the student in learning to spell words that he is likely to use in his current writing. These lists also prepare him for the use of other words he will use in his later writings.

**Why Errors Occur.** The first problem in learning to spell has now been solved. The words most commonly written by both children and adults have been selected. The second problem of the spelling student is to decide what words are unusually difficult and need special study. These words are commonly called spelling *demons*, because they have an irregular arrangement of letters. Much research has been done on the matter of demons. Authors of good spelling texts have used the benefits of such research in writing their books. They make sure that the demons are given more attention and practice than words that are regular in their spelling and therefore easier to learn.

The word *fasten* is a typical example of a spelling demon. The majority of those who misspell the word write it as *fasen*, because the *t* is silent and not sounded when the word is spoken. Another demon is *sergeant*. It is often written as *sargeant*, because the first *e* has the

sound of *a*, or else *sergent*, omitting the *a* which is silent in pronunciation.

There is another important cause of spelling errors. This is the failure to pronounce a word accurately and distinctly. An example is the word *government*. Many people forget to sound the *n*, *gov-er-N-ment*. If one says *gov-er-ment*, he is likely to spell the word without the *n*. Another word that is commonly misspelled because of an incorrect pronunciation is *perform*. If one says *pre-form* in speaking, he is apt to spell it that way in writing. Words of this type are not generally called demons. But they need as much attention and practice as the more widely recognized demons, since they are almost equally difficult to master.

**Grouping Words for Study.** The third problem in learning how to spell is to find the best grouping or arrangement of words for study. There are two major systems of word arrangement used in modern schools. The first is a list of words which are unrelated to each other in meaning. For example, some spellers group words by families, such as those that end in *ll*. Such words would be *hill*, *tell*, *ball*, *pull*.

The second system of word arrangement is the grouping of words around a central idea, for example, the recording of an exciting moment while skating. "The thin ice suddenly cracked under my skates. Danger made my breath come fast. I quickly turned toward shore and fairly flew over the dangerous thin ice to safety." The author of a spelling text may group several of these words in one spelling lesson. Such words would be *suddenly*, *thin*, *cracked*, *skates*, *breath*, *quickly*, *safety*, and *danger*.

Research shows that each type of grouping has advantages. Most modern spelling books use both types of grouping.

**Many Systems of Word Study** are used in spelling texts. Some systems are built on the weekly plan, which is spending fifteen minutes a day for five days a week on a list of words. Other systems are based on the daily plan, which is the mastery of one or two words each day. But there are two general approaches to spelling, regardless of whether the study plan is for a day or a week. The first approach is the idea of *test, study, and test*. The pupil takes a test on the list of words to be learned. He then concentrates his study on those words that he misspelled in the test. A second test follows to determine whether the pupil has mastered all the words in the list.

The second approach to spelling is the idea of *readiness, study, test, study, test*. In this plan, the first step of readiness is the preparation for the word list by a discussion of the ideas behind the words. Then the student studies all the words to gain the correct impressions and habit patterns of the words. The remainder of the system — test, study, and test — is carried on in the same manner as the first approach.

How does one go about learning the spelling of a single word? Most techniques of study are based on six steps.

1. Look at the word. Pronounce it carefully.
2. Look at the word. Say the letters.
3. Do not look at the word. Say the letters.
4. Look at the word. Write the letters.

5. Do not look at the word. Write the letters.
6. Compare the spelling with the word. If it is spelled correctly, go on to the next word. If an error has been made, go through the six steps again.

**Adding New Words.** There are many ways of constantly adding new words to one's spelling equipment. One way is to master the general rules for spelling the derivatives — that is, the words taken from root words. For example, consider the root word *develop*. The rule for the spelling of its derivatives simplifies the spelling of such words as *develops*, *developed*, *developing*, and *developer*. There are many irregularities in making derivatives of English root words. But enough words are regular so that learning the general rule is an important aid to spelling. An example of an irregularity is the root word *teach*. *Teaching* is correct but *taught* is used instead of *teached*.

Another important spelling aid is the dictionary habit. One should consult a dictionary and note the exact pronunciation and spelling of all new words. The words should be studied at once and practiced for spelling, in order to fix the habit firmly in the written vocabulary. Some adults have active written vocabularies of 25,000 words or more. Most of these words were learned through the dictionary habit.

**Simplified Spelling.** Many attempts have been made to simplify the spelling of the English language. Most of these attempts are based on the plan of spelling a word exactly as it is pronounced. For example, under this system *though* would be spelled *tho*, *knock* would become *nock*, and *sphere* would be *sfere*.

All attempts to reform the spelling of the English language have met strong opposition. The protests are based chiefly on two arguments. (1) Simplified spelling destroys the familiar word pattern and results in confusion in writing and reading. (2) The second argument is based on the fact that pronunciation of words continuously changes through the years. Word forms would soon become unrecognizable if the spelling were changed to meet each new method of pronunciation. None of the great English literature of the past could be enjoyed without frequently consulting specialized dictionaries. For example, in the days of Alexander Pope in the early 1700's, the word *join* was pronounced *jine*. If the spelling had been changed, the word would have little meaning in modern times. Pope's entire work would be neglected except by scholars who had the time and patience to translate the literature into current English.

One may ask how important is spelling in the world of affairs. The answer lies in the fact that spelling often is used as a measure of one's learning. Few things are more critically observed by others than a person's ability to spell accurately. Jobs increasingly demand a high degree of spelling ability.

P.R.H.

See also ABBREVIATION; ELISION.

**SPELLMAN, FRANCIS CARDINAL** (1889- ), is one of the outstanding leaders of the Roman Catholic Church in the United States. His wide acquaintance among church officials throughout the world made his services valuable in special missions for both Presidents Franklin D. Roosevelt and Harry S. Truman. During World War II, Spellman served as apostolic vicar to the

United States armed forces, and made several trips to various battle areas. Pope Pius XII named him a cardinal in 1946.



Acme  
**Cardinal Spellman**, one of the most important Catholic leaders in the United States

Spellman was born at Whitman, Mass. He took his college degree at Fordham University, and was ordained a priest in 1916 after studying at the North American College in Rome. His first post was in Boston. From 1925 to 1932 he was in the service of the Papal Secretariat in Rome. He was consecrated a bishop in Rome, and returned to serve as Auxiliary Bishop of Boston. In 1939 Pope Pius XI named him Archbishop of the See of New York.

F.J.S.

See also CARDINAL.

**SPELMAN COLLEGE** is a privately controlled school for Negro women at Atlanta, Ga. It is part of the Atlanta University System of colleges. The college has a school of liberal arts and science and a school of nursing. Courses lead to degrees of B.A. and B.S. Spelman College was founded in 1881. Average enrollment is about 350.

**SPELMAN FUND OF NEW YORK.** See EDUCATIONAL FOUNDATIONS AND ENDOWMENTS (Rockefeller Enterprises).

**SPELTER.** See ZINC.

**SPELTER SOLDER.** See BRASS (Varieties).

**SPENCER.** See DRESS (Nineteenth Century).

**SPENCER, ANNA GARLIN** (1851-1931), was an American educator, reformer, and minister. She became noted as a champion of women's rights because of her *Woman's Share in Social Culture*. The book deals with the history and development of social practices and was published at a time when woman's place in business, the professions, and politics was disputed. It showed how men and women working together had raised the level of society.

Anna Garlin was born in Attleboro, Mass., and was largely self-educated. At eighteen she became a reporter for the Providence (R.I.) *Daily Journal*, and the following year taught in the Providence public schools. She continued working as a reporter until 1878, when she was married to William Henry Spencer, a Unitarian minister. Anna Spencer was a forceful public speaker, and from time to time she preached in her husband's church. In 1891 she became a clergyman and served for fourteen years as minister of an independent congregation at the Bell Street Chapel in Providence.

During these years her work in education and social reform made her a national figure. For the next twenty-five years she lectured widely on suffrage, temperance, child labor, and world peace.

R.M.B.

**SPENCER, HERBERT** (1820-1903), was an English philosopher. He is noted for his attempt to work out a philosophy based on the scientific discoveries of his day which could be applied to all subjects.

In his great work, *Synthetic Philosophy*, Spencer ap-

plied his fundamental law, the idea of evolution or gradual development, to biology, psychology, sociology, and other fields.

In his work on biology Spencer traced the development of life from its lowest recognizable form up to man. According to Spencer, the great law of nature is the constant action of forces which tend to change all forms from the simple to the complex. Spencer explained that the mind of man has developed in this same way, advancing from the simple automatic responses of the lower animals to the reasoning processes of the thinking man. He claimed that knowledge was of two kinds, the knowledge gained by the individual, and the knowledge gained by the race. He said that intuition, or knowledge learned unconsciously, was the inherited knowledge or experience of the race.



U & U  
Herbert Spencer tried to adapt modern science to philosophical teachings.

Spencer believed that there is another force called dissolution which tends to break things down to simpler forms. He said that progress depends on whether the force of evolution or dissolution is the stronger. Spencer applied these same laws to politics and society and explained the origins of laws and customs.

Spencer, the son of a schoolmaster, was born at Derby. He was a delicate child and his early education was supervised by his father, a man with advanced ideas. Spencer's first interest was biology, but he later turned to engineering. From 1837 to 1846 he worked as an engineer for the London and Birmingham Railway. Afterward he served as editor of the *Economist*.

In 1853 he left the *Economist* to spend all his time in writing *Synthetic Philosophy*. He worked so hard on *The Principles of Psychology* that he ruined his health. Spencer gained a wide reputation as a philosopher, but scientists later proved many of his theories wrong. See also AGNOSTIC. B.B.

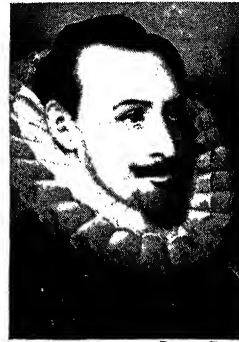
**SPENDER, STEPHEN** (1909- ). See ENGLISH LITERATURE (Twentieth Century).

**SPENGLER, OSWALD** (1880-1936), was a German philosopher. In his book *The Decline of the West*, he predicted that democracy would give way to a period of dictatorship throughout the world. Spengler was born at Blankenburg and taught at Hamburg.

**SPENSER, EDMUND** (1552?-1599), was a great English poet of the Elizabethan Age. Although his *Faerie Queene* was never completed, it ranks among the greatest narrative poems in world literature. The author intended the allegory to have twelve books, in which twelve knights would represent twelve moral qualities. The character of each knight was to be drawn from such famous persons of his time as Sir Walter Raleigh and Sir Francis Drake. But Spenser finished only six books, and two cantos of *Mutabilitie*. The form of stanza Spenser used has been given his name. Spenser crystallized the forms and patterns of English verse. The music of his verse, the beauty of his sentiments, and the ex-

alted fancies of his imagination made such an impression on later great poets, notably John Keats, that Spenser has been called "the poet's poet."

Spenser was born at East Smithfield, London, and attended the Merchant Taylors' School. Even as a boy he wrote verse and some of his poems and translations were probably published as early as 1569 in John van der Noodt's *Theatre for Worldlings*. Spenser received an M.A. degree from Pembroke Hall, Cambridge University, in 1576. Two years later he entered the household of the Earl of Leicester. In 1579 Spenser published his



Brown Bros.  
Edmund Spenser was one of the greatest of English epic poets.

*Shepherd's Calender*, which was dedicated to Sir Philip Sidney. Sidney introduced the young poet into Queen Elizabeth's court. As under-secretary to Lord Grey de Wilton, the lord deputy of Ireland, Spenser took part in restoring peace in that country at the time of Desmond's rebellion.

After 1586 he lived in Kilkenny Castle in Cork, on a large estate given him by the government. Here he continued writing *The Faerie Queene*, which he had begun several years before. On the advice of Sir Walter Raleigh, he submitted the manuscript at court, but he was given only a small pension in recognition of his ability. His "Colin Clout's Come Home Againe" shows his disappointment. The first three books of his allegory were published in 1590, and were eagerly received by the public. *Complaints*, a collection of short poems, appeared in about 1591.

Spenser was greatly interested in government. His views of the Irish policy, which he admitted was cruel but necessary for the maintenance of English power, show that he was a shrewd public official, as well as a gentle, dreamy poet. After Spenser returned to Ireland, he married Elizabeth Boyle. His mother was also named Elizabeth. The Elizabeth described in *The Faerie Queene* probably referred both to his wife and to his mother, as well as to the queen of England. He described his courtship in the *Amoretti*, a series of sonnets, and his marriage was made memorable by the "Epithalamion," the finest of English wedding songs.

In 1596 the second installment of three books of *The Faerie Queene* appeared, as well as "Foure Hymnes" and the "Prothalamion." "View of the State of Ireland," also written in 1596, was not published for many years. But these works did not advance him at court, and he returned from another visit to England more discouraged than ever. Two years later Irish rebels broke into his castle and burned it. One of his children is said to have lost his life, and Spenser narrowly escaped with the rest of his family. Shortly afterward he died penniless in a London inn. He was buried near Geoffrey Chaucer in Westminster Abbey. J.A.

See also ALLEGORY; ENGLISH LITERATURE (The Tudor Period).

**SPENSERIAN STANZA.** See POETRY (Poetic Form).



**SPERMACETI**, *SPUR mah SE tih*, is a waxy substance obtained from the sperm whale and other members of the whale family. The best spermaceti is obtained from a thick, oily fluid in the head of the whale. Spermaceti is also obtained from the whale fat, or blubber. The oil and blubber are heated and separated into sperm oil and spermaceti, which comes out as a mass of flaky white crystals. An average sperm whale yields about twelve pounds of spermaceti. When spermaceti is purified, it is smooth and solid, and looks somewhat like the tallow from which candles are made. It was once used to make candles, but is now used chiefly in the preparation of ointments and cosmetics. See also CACHALOT. G.R.G.

**SPERMATOPHYTE**, *SPUR mah toh FITE*. See BOTANY (Names of Plants; illustration).

**SPERMATOZOON**, *SPUR mah toh ZOH n* (plural, spermatozoa). See FERTILIZATION.

**SPERM WHALE**. See CACHALOT.

**SPERRY, ARMSTRONG** (1897- ), is best known for his books for young people about the sea and the South Sea Islands. He wrote and illustrated *Call It Courage*, which won the Newbery medal in 1941. Sperry was born in Connecticut. As a boy, he became interested in the sea from stories told by his great-grandfather, who had been a sea captain. Sperry attended the Yale Art School until he joined the navy during World War I. After the war he studied at the Art Students' League in New York City and with the well-known artists, George Bellows and Luis Mora. Later he spent two years in the South Pacific, where he made friends among the people and learned their legends. See also NEWBERY MEDAL. F.G.

**His Works**, which he both wrote and illustrated, include *One Day with Manu*; *One Day with Jambí*; *One Day with Tuktú*; *No Brighter Glory*; and *Storm Canvas*.

**SPERRY, ELMER AMBROSE** (1860-1930), was an American scientist, inventor, and manufacturer. He is best known for his development of the gyroscope for use in navigation. His enterprises included the manufacture of arc lamps in Chicago, electric railways in Cleveland, Ohio, and gyroscopes in New York City.

Sperry was born in Courtland, N.Y., and studied at the State Normal and Training School and at Cornell University. While still in college he attracted attention by building an arc lamp with a dynamo to run it. The lamp was much more efficient than any other then used for street lighting, and at the age of nineteen Sperry set up his first factory to produce his lamp. Forty years later he returned to the field of lighting and developed the powerful beacon and searchlights now used by many armies and navies. In the meantime he also developed electrically driven mining equipment and electric automobiles and streetcars.



Sperry Gyroscope Co., Inc.  
**Elmer Sperry** developed many uses for the gyroscope.

Sperry first used the gyroscope in 1911 to develop a new kind of compass for ships. The increase in the amount of steel used in shipbuilding had made magnetic compasses unreliable. Sperry's gyrocompass successfully solved this problem. From his first gyrocompass, Sperry developed the gyropilot which steers a ship automatically. Later he installed giant gyroscopes which were able to steady the rolling motions of ships. After the United States entered World War I, Sperry developed a number of important instruments for gun control. These inventions increased the effectiveness and range of gunfire and torpedoes. During the war, he also produced an aerial torpedo that operated under gyroscopic control.

Modern naval gunnery methods would be impossible without the inventions which grew out of Sperry's original gyroscope. During World War II it was adapted for use in many complex instruments of warfare, such as naval gunsights. His inventions were equally important for their uses in navigating aircraft. J. CoR.

See also GYROSCOPE.

**SPHAGNUM**, *SFAG num*, **MOSS**. See PEAT MOSS.

**SPHALERITE**, *SFAL er ite*. See ZINC.

**SPHENOID**, *SFE noid*, **BONE**. See HEAD.

**SPHERE**, *sfeer*, is the name of a solid bounded by a curved surface, all points of which are equally distant from its center.

A plane through the center of the sphere cuts it in halves. The section is called a *great circle* of the sphere. The radius and diameter of the great circle are the radius and diameter of the sphere. See CIRCLE.

**Surface and Volume of a Sphere.** A sphere is related to a cylinder in a rather curious way. Consider the following formulas.

The lateral area of this cylinder is  $2\pi rh$ . But  $h = 2r$  (see the figure), and this lateral area is  $\pi r^2$ , or four great circles. The area of the sphere is also  $4\pi r^2$ .

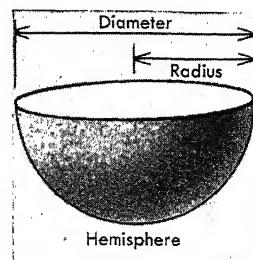
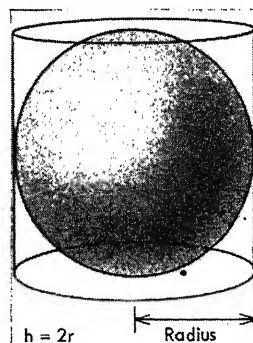
The volume of the cylinder is  $\pi r^2 h$ . Substituting  $2r$  for  $h$  gives  $2\pi r^3$  for the volume of this cylinder. The volume of the sphere is just  $\frac{2}{3}$  that of the cylinder, or  $\frac{4}{3}\pi r^3$ .

Formula for area of sphere:  $A = 4\pi r^2$ .

Formula for volume of sphere:  $V = \frac{4}{3}\pi r^3$ .

**Similar Solids.** All spheres have the same shape and all are similar solids. Corresponding lines of similar figures are proportional. If one line is doubled, all lines are doubled.

Surfaces vary as the square of their radii. If the radius is doubled, the resulting surface is increased four times. Volumes vary as the cubes of the radii. An orange which has 3 times the diameter of another orange will also have



9 times the surface and 27 times the volume.

**Problems.** (1) Find the cost of covering the dome of the state Capitol with gold leaf at \$3 a square foot. It is a hemisphere, radius 40 feet.  $\frac{1}{2}(4\pi r^2) \times 3$ .

(2) A spherical tank for storing illuminating gas is 30 ft. high. Find the cost of painting its outside at 20 cents a square foot. Find the number of cubic feet of gas it will hold.  $\frac{4}{3}\pi(15)^3$

(3) If oranges 2 inches in diameter are worth 20 cents a dozen, what is the worth of those 4 in. in diameter?

3 in.? Remember that  $\frac{V}{V} = \frac{r^3}{r^3}$ . See CONE.

(4) The gas company wants to set up a new spherical tank (see Problem 2). The tank has 4 times the radius of the present tank. It will cost 9 times as much to paint it. Why? The contents will increase  $3^3$  or 27 times. Why is this true? H.C.B.

**SPHERICAL ABERRATION.** See ABERRATION.

**SPHEROID, SPHEROID.** See GEOMETRY (Terms).

**SPHINX, sfinks,** is an imaginary creature of ancient myths. The sphinx of Greek myths was a wicked being. It usually had the body of a lion, the head of a woman, the tail of a serpent, and the wings of a bird. This creature lived in a cliff just outside the city of Thebes, and guarded the road to the city. She asked everyone who passed this riddle: What animal walks on four legs in the morning, two at noon, and three in the evening?

**The Great Sphinx at Giza, Egypt,** stares with sightless eyes across the desert, as it has for more than 4,800 years. The photograph was made after the lower part of the great statue

If the person could not give the right answer, she ate him at once. When Oedipus passed on his way to Thebes, the sphinx asked him to answer the riddle. Oedipus said that the animal was man, because man walked on hands and feet when he was young, on two feet in the middle of life, and with a staff in old age. The sphinx was so angry because he had given the right answer that she howled with rage. Then she threw herself from the rocks, and died.

**The Egyptian Sphinx.** This creature had the head of a man, and the body, legs, feet, and tail of a lion. It had no wings. Originally the sphinx was supposed to represent the god Horus, who guarded temples and tombs. When a statue was made of the sphinx, the face usually looked like the Pharaoh who ruled at the time. The Pharaoh was believed to be a god. The Egyptians made many statues of sphinxes. Sometimes these lined both sides of an avenue leading to a temple, as at Karnak.

**The Great Sphinx.** This huge stone creature stands near the Great Pyramid at Giza. It is one of the most famous monuments in the world. The head and body are carved out of solid rock. The paws and legs are built of stone blocks. It is believed that the Great Sphinx is a portrait of the Pharaoh who built it, but no one knows which Pharaoh built the Sphinx, or when. It was stand-

had been uncovered by scientists in 1926. The forefeet are made of huge pieces of stone masonry. In the background are three pyramids — once tombs of Egyptian rulers.

Ewing Galloway



ing at the time of Cleopatra, about 2900 B.C., for he repaired it. This great figure is 240 feet long and about 66 feet high. The width of the Sphinx's face measures 13 feet, 8 inches. The Arabs shot at the head with their guns. Desert sands also wore away the stone, so now the face is badly scarred.

Sand blows over the base of the sphinx and keeps it buried most of the time. The base was completely uncovered in 1926, probably for the first time in 3,000 years.

H.McP.D.

**SPHINX MOTH.** See **HAWK MOTH**; **MOTH** (Hawk Moths).

**SPHYGMOMANOMETER**, *SFIG moh mah NAHM ee ter*. See **MANOMETER**.

**SPICA**, *SPI kah*, a star. See **ASTRONOMY** (Spring, in the chart Showing the Positions of the Chief Constellations).

**SPICE** is the name given to a group of plant products which have a sharp taste and odor. Spices are used to season foods. Some spices are valued for their taste, and others for their smell. The many spices that are commonly used include pepper, nutmeg, cloves, ginger, allspice, mace, mustard, and cinnamon. They come from different parts of the various spice plants. For example, cloves come from the bud, cinnamon from the bark, and pepper and nutmeg from the fruit of the plant. Ginger is taken from the root and mustard is taken from the seed. Spice plants are grown in many tropical countries.

Many individuals prefer to grow such spices as sage, marjoram, thyme, and others in their own gardens. Then they dry the plants for use later on. It is also possible to grow some common spices indoors if the plants are placed in pots in sunny windows.

Spices have very little food value. They are used because they increase the appetite and stimulate the organs of digestion. Spices must not be used too generously, for they can be harmful to the body. At one time, before foods were refrigerated or canned, spices were considered useful in making tainted foods taste better.

Spices have played an important part in history. At one time, the cities of Genoa and Venice were great and powerful because they were the center of the spice trade with the East. When Columbus and the early discoverers set sail across unknown seas they were very much interested in discovering new routes to the spice lands of the East. Merchants made great profits in the early days of the spice trade. Even in modern times, spices are important. World War II, for example, temporarily destroyed many of the East Indian sources of spices. Pepper supplies dwindled sharply in the United States.

H.N.M.

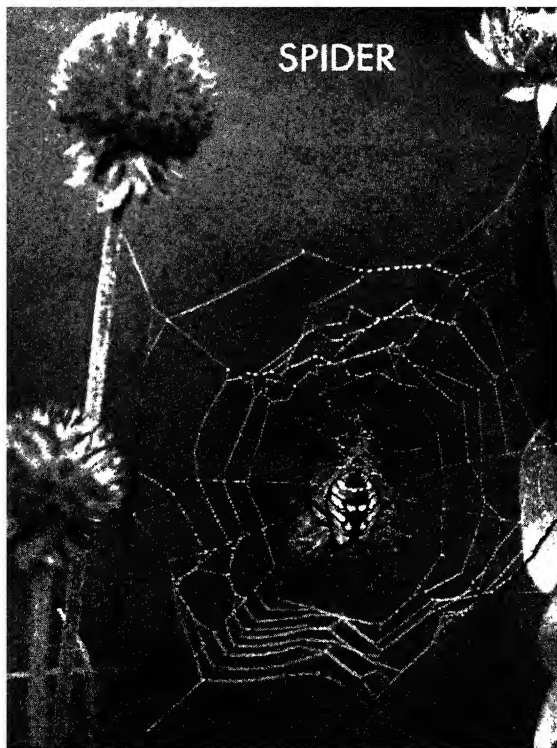
**Related Subjects.** The following spices are described in these volumes:

Allspice  
Anise  
Caper  
Capsicum  
Caraway  
Cardamom  
Cayenne Pepper  
Cinnamon  
Clove

Coriander  
Cubeb  
Ginger  
Mace  
Mustard  
Nutmeg  
Paprika  
Pepper

**SPICE ISLANDS.** See **MOLUCCAS**.

**SPICULE**, *SPICK yule*. See **SPONGE**.



**SPIDER**, *SPI der*. Spiders are small animals that spin silk webs. They use their webs as nets to catch insects which they eat. Many persons fear spiders and kill any they find. They would not do this if they knew that spiders eat many harmful insects, and are really helpful to man. Spiders seldom bite unless they are disturbed, and only a few kinds, such as the black widow, have a dangerous bite.

Spiders live in many parts of the world, from places more than twenty thousand feet high, to deserts below sea level. Fossils, or hardened animal remains, show that spiders have lived on earth for many millions of years. The largest spiders are the tarantulas. Some tarantulas in the tropics have legs that spread more than eight inches.

Spiders are not insects. They are arthropods, like the insects, but they belong to a different class called the *arachnids*. They are relatives of daddy longlegs and mites, and more distant relatives of scorpions and crabs.

The body of an arachnid is divided into two parts, joined by a slender waist. The front part is called the *thorax*. The head is not a separate part, as in an insect, but forms one piece with the thorax. The back half of a spider's body is called the *abdomen*. It contains the intestine, breathing organs, heart, reproductive organs, and spinning organs. Insects have three body divisions, and usually four wings. Spiders have no wings.

Insects have only three pairs of legs. Spiders and nearly all other arachnids have four pairs. The legs are connected to the thorax. They are long and thin, have seven joints, and end in tiny claws. The legs are chiefly for running, jumping, and climbing. Some kinds of spiders can move in any direction—forward, backward, and sideways. In front of the legs are the *palpi*, a pair of feelers that the spider holds up when it walks.

Spiders have two pairs of mandibles, which are like

jaws. The first pair end in poison fangs for killing the spider's prey. Most spiders give out so little poison that the bite usually feels no worse than a mosquito bite.

Spiders have no feelers or antennae, but most kinds have eight eyes in the front of the head. The breathing organs are in two sacs in the underside of the abdomen. They contain several thin tissues like the leaves of a book. Slits on the abdomen open into these sacs.

The spinning organs, or spinnerets, are at the hind end of the abdomen. There are three pairs of glands, each with a separate tube to the outside.

#### Weaving of the Web.

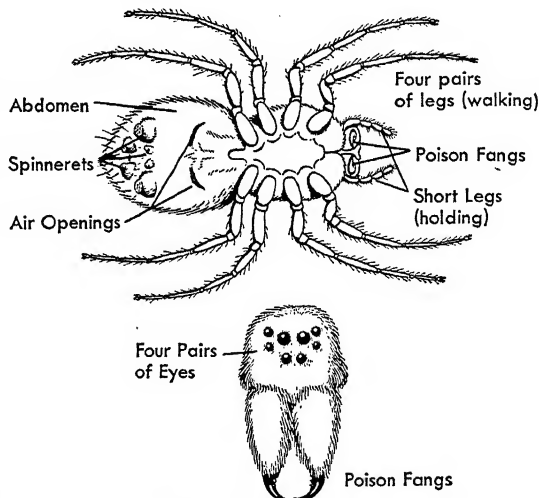
When a spider begins to spin a thread, it presses the spinnerets against some object and forces out some of the liquid silk. Then it moves away, and draws out the sticky liquid, which hardens in the air. The spider can keep the spinnerets together and make one thick thread, or hold them apart for a band of fine threads.

The orb weaver spiders are the easiest to study as they build their webs. These spiders do not begin spinning until nightfall, so the student will need a flashlight to watch them. A good example of the orb weavers is the large black and yellow garden spider, *Epeira gemma*.

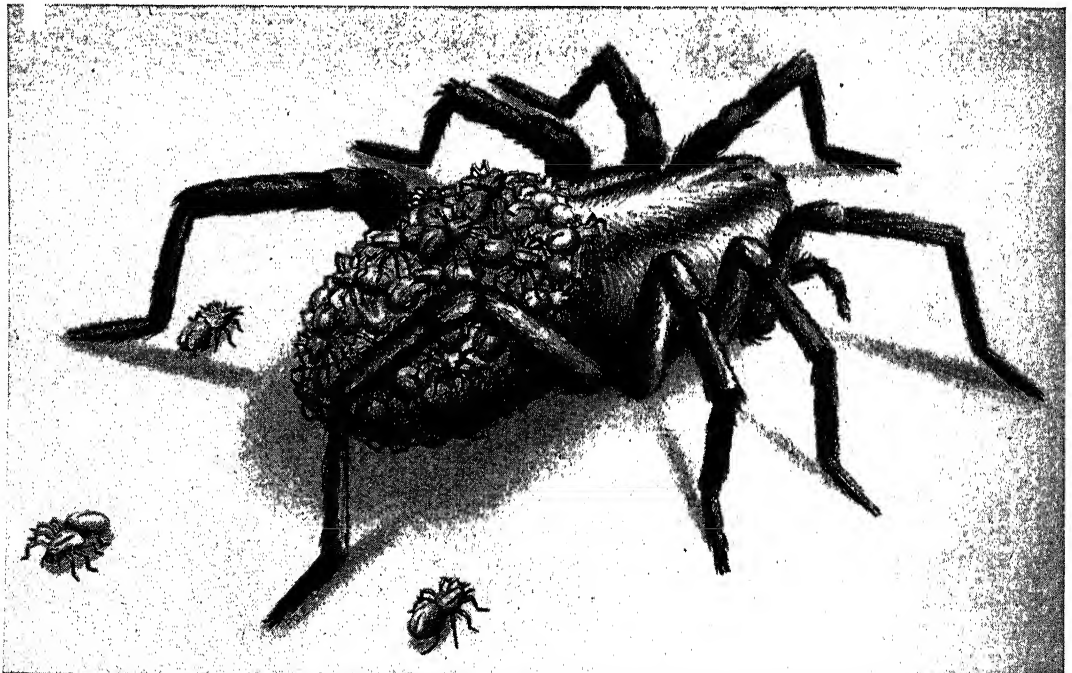
This spider attaches its strands to the branch of a tree or a plant that may be quite high off the ground. The animal uses one of its hind legs to draw the silk from the spinnerets until a sticky thread floats through the air. When this thread sticks to some objects a few feet or yards away, the spider fastens its own end. Then it crosses back and forth over the bridges adding silk until it is strong enough to hold up the web. Next the spider starts a second thread somewhere along the bridge and drops itself as it spins it out from the spinnerets. It fastens this thread to some solid object below. The spider then climbs back up the thread to the main strand, and attaches other threads to it in the same way. These threads form the framework of the orb

web, like the spokes of a wheel. The spider finishes the web with spiral strands from spoke to spoke. The web usually hangs up and down, so that it will catch flying insects. The web is often called a *cobweb*.

When the web is finished, the spider may wait in the center, or it may stay at one side, holding a strand attached to the center. When an insect is caught it shakes the web, and the spider hurries down to bind it with more strands. The spiral threads are covered with

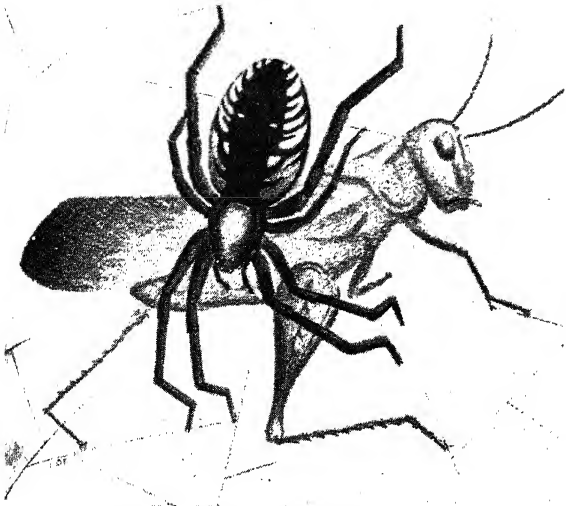


The Body of the Spider

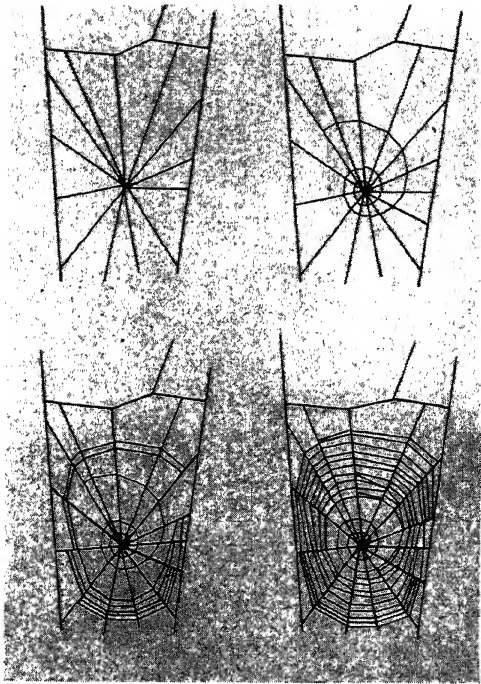


The Mother Wolf Spider Carries Its Young on Its Back Until They Are Able to Take Care of Themselves

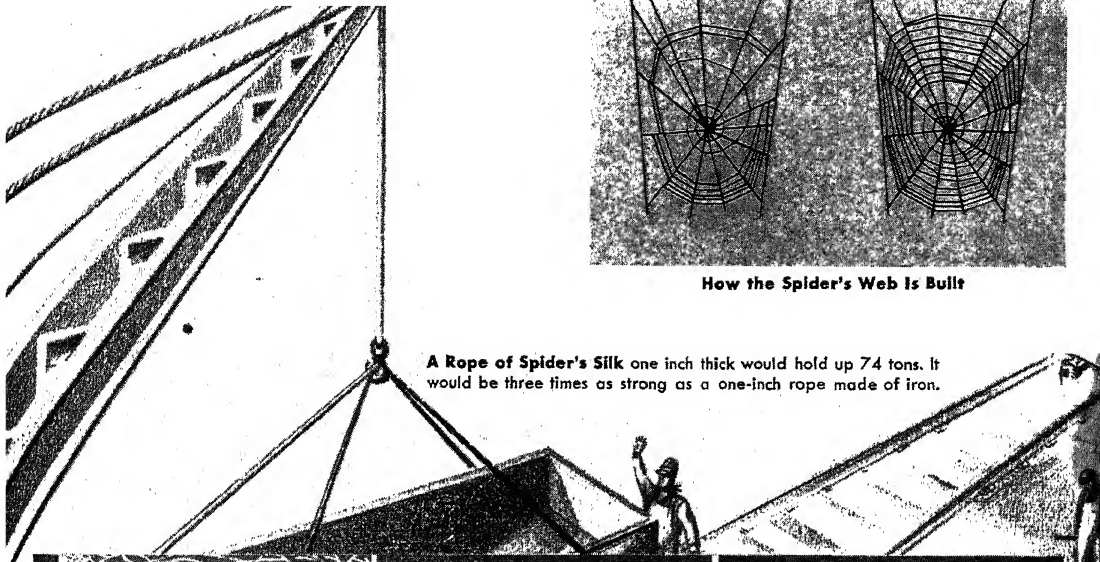
# THE SPIDER AND ITS WONDERFUL WEB



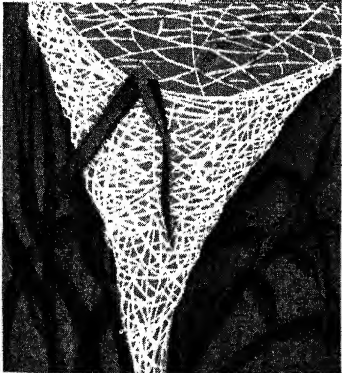
**A Spider Feeds** on a garden insect that has been caught in its web. Spiders destroy thousands of harmful insects yearly.



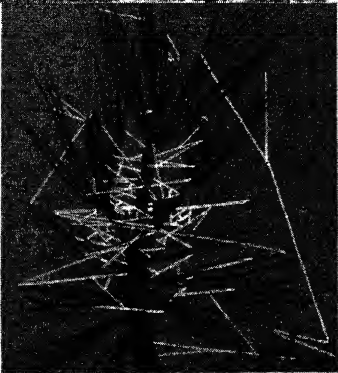
**How the Spider's Web Is Built**



**A Rope of Spider's Silk** one inch thick would hold up 74 tons. It would be three times as strong as a one-inch rope made of iron.



**Funnel**

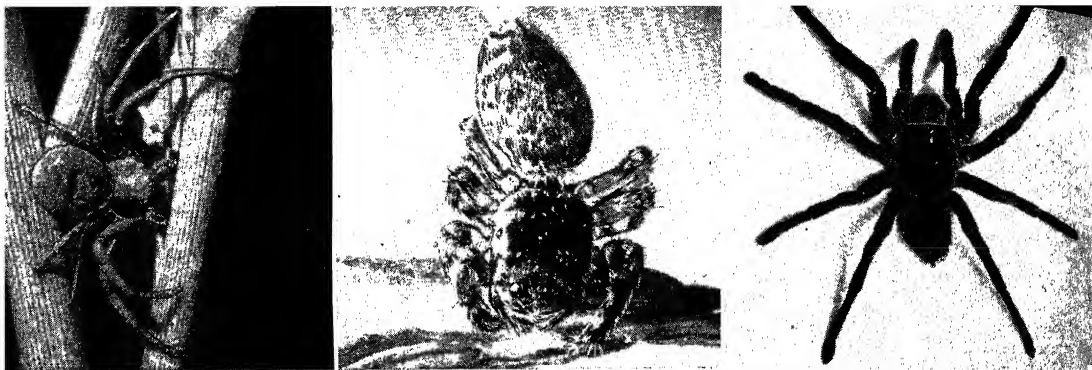


**Blanket**

**Types of Webs**

**Orb**





Photos: L. W. Brownell; Cornelia Clarke; Ewing Galloway

**Some Members of the Spider Family. Left to Right, They Are: Crab Spider, Balloon Spider, and Bird Spider**

a sticky substance to hold the captive. The famous naturalist, Jean Henri Fabre, discovered that the spider coats its own legs with an oily substance from its mouth. Then it can pass over the sticky web without being caught itself.

When the captured insect is completely bound with webbing, the spider eats it. Spiders suck out only the body fluids. When the meal is done, the spider cuts away the strands, and the body of the victim falls to the ground. Then the spider quickly repairs the broken part of the web. It may capture several insects before morning, if it is hungry enough.

Some kinds of spiders build webs that are much simpler even than that of the orb weaver. Another type of web seen in fields and gardens is the delicate, filmy dome. It hangs with the opening at the bottom. The single shining threads which often hang between stalks of grass are spun by young spiders. The young of some kinds can "balloon" through the air. When the little spider is ready to leave its home, it climbs up on some high place, and sends out a thread of silk. As the wind catches the thread, the creature spins more until there is a long streamer. Finally the wind lifts the tiny spider in its streamer and carries it away to a new home, sometimes far distant. Flying, or ballooning, spiders have been found sailing through the air far out in the ocean away from land.

The female spider usually spins the web and catches the food. Males are often smaller than females. It is also easy to tell a grown male from a female by the male's feelers or palpi. The ends of the palpi become swollen, like tiny bulbs, and serve as sex organs. The spider stores sperm fluid in them, and uses them to fertilize the female's eggs. The female lays the eggs in a silky sac, which protects them from the weather. Sometimes there are many hundreds of eggs. The eggs laid in the autumn take all winter to hatch. But eggs laid in early summer take twenty to sixty days. In some types of spiders, the mother opens the egg sacs for the young spiders. But other kinds die after laying their eggs, and the young must cut out a small opening for themselves. Young spiders always stay in the sac until they are old enough to make their own webs and capture insects. Some spiders live only a year, while others may live two years or more. Unlike insects, they do not go through the separate stages called *metamorphosis* in the change from caterpillar to adult.

**Kinds of Spiders.** There are many different kinds of spiders, with different habits. Large spiders of tropical South America eat hummingbirds as well as insects.

The *trap-door spider* digs a burrow in the ground, and covers it with a lid of silk. It waits in its burrow until it feels the vibration of an insect's footsteps above. Then it pops open the trap door and catches the insect. The *wolf spider* is another kind that digs a burrow in the ground. Instead of building a web, it creeps up on its insect victim the way a cat stalks a mouse. Then it springs, and its poison fangs quickly end the insect's struggles. The mother wolf spider carries her babies on her back for a few weeks after they have hatched which gives them a better start in life.

The *crab spider* can move backwards like a crab. Its two front legs spread three times the length of its body. This spider does not make a web, but waits for insects inside a flower. It catches them when they come for nectar. Some crab spiders can change color to match the color of the flower. Most crab spiders are white or yellow.

*Jumping spiders* have a habit of almost letting a person touch them. But when the hand comes too close, the spider jumps away. These spiders are often seen on weather-beaten fences or old wood. The males court the females with a kind of dance.

The *water spider* spins a web under water, like a balloon with the entrance at the bottom. This spider collects air bubbles on the hairs of its body, and carries them down to inflate its nest.

The *black widow* is perhaps the most poisonous of spiders. Its bite makes a person very ill, and has been known to cause death. The black widow is common in the United States, especially the southern part. It is a large, shiny black spider with a reddish hourglass mark on the abdomen. It likes to build its irregular web in hidden, unswept corners.

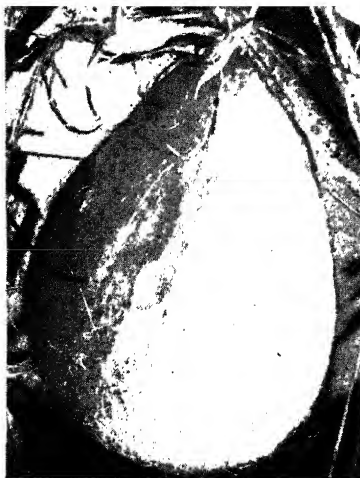
Many creatures eat spiders, but the wasps are their worst enemies. The wasps kill spiders and seal them up in cells for the larvae to feed on.

Spiders kill all kinds of insects, including many that are harmful to man. Insects would destroy many of our crops of grain, vegetables, and fruit were it not for spiders, birds, and certain wasps.

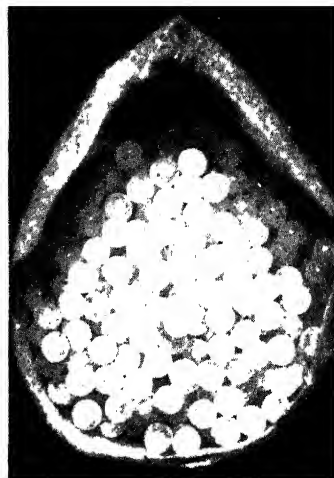
Spiders are also among the fiercest cannibals in the animal kingdom. When extremely hungry, females often kill their mates, which are smaller. A number of spiders placed together eat one another. This habit makes it hard to raise much spider silk. This silk could be used for cloth if there were enough of it. Spider silk is very strong and elastic. It can stand the strain of the wind, and of trapped insects. Thin strands of spider silk are used for cross lines in the eyepieces of instruments, such



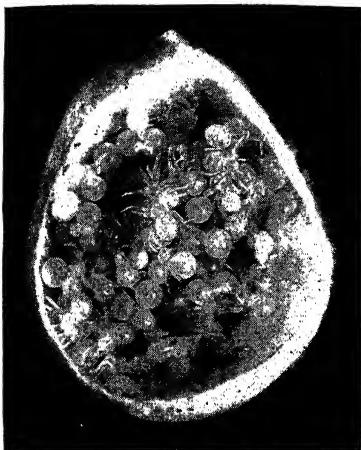
**A Black Widow** finishes its egg-cocoon after three hours' work.



**The Beautiful Spinning** that went into the cocoon is clearly shown here.



**Cut Apart**, the cocoon discloses the freshly deposited pearly eggs.



**The Tiny Spiderlings** start to hatch out in from 14 to 30 days.



**The Growing Spiderlings** leave the cocoon through a tiny hole in its side.



Photos: Lee Passmore

**This Immature Female** black widow is about three months old.

as microscopes, telescopes, telescopic gun sights, and surveyor's transits.

**Legend about the Spider.** There are many interesting stories and superstitions about spiders. One story tells how the Scottish hero, Robert Bruce, learned to overcome failure by watching a spider try again and again to fasten a thread.

An old superstition says that a person can cure his fever if he wears a spider in a nutshell fastened to his neck. Longfellow mentions this superstition in *Evangeline*.

The arachnids get their name from the Greek myth of Arachne. This beautiful maiden boasted that she could spin better than the goddess Minerva. She lost the spinning contest, and the goddess punished her by changing her into a spider. L.P.

See also **ANIMAL** (color plate, Leading Groups in the Animal Kingdom); **ARACHNID**; **BLACK WIDOW**; **TARANTULA**; **TRAP-DOOR SPIDER**.

**Classification.** Spiders are arthropods of the class *Arachnida*. True spiders belong to the order *Araneae*, but all the arachnids are generally called spiders. The order is divided into several families, including

*Aviculariidae*, the trap-door spiders; *Epeiridae*, round-web spiders; and *Thomisidae*, the crab spiders.

#### Questions

Are spiders insects? How can you tell?

Should most spiders be killed? Why or why not?

What are the largest spiders known?

How do spiders see? How do they breathe?

Why doesn't the orb weaver stick to its own web?

How are female spiders usually different from the males of the same class?

What is unusual about: (a) the trap-door spider, (b) the wolf spider (c) the crab spider (d) the black widow?

What are the spider's worst enemies? Why?

How strong is spider silk? How is it sometimes used?

**SPIDER LILY.** See **FLOWER** (color plate, Flowers of Lake, Stream, and Swamp).

**SPIDER MONKEY.** See **ANIMAL** (color plate, Central and South America); **MONKEY** (Kinds).

**SPIDERWORT, *SPI der wurt*,** is the common name for a group of mostly tropical plants. Some of them are ornamental plants. The leaves of the spiderworts often are grasslike and, in some cases, are striped. The flowers



J. Horace McFarland

**Spiderwort is a Favorite Perennial Plant** because of its sturdiness and its lovely flowers, which grow in several colors.

may be blue, purple, or white. These flowers are very fragile and may dissolve into watery jelly.

Some kinds of spiderworts grow erect, and some run along the ground. The common spiderwort is the best-known of the erect plants. An example of creeping spiderwort is the wandering Jew, which often grows under benches in greenhouses.

The spiderworts are perennials, and do not have to be replanted each year. They usually are propagated by cuttings from an old plant.

P.C.S.

See also WANDERING JEW.

**Classification.** Spiderwort is the common name for the genus *Tradescantia* of the family *Commelinaceae*. The common spiderwort is *T. virginiana*; the wandering Jew is *Zebrina pendula*.

**SPIEGELEISEN, SPE gel EYE zen.** See MANGANESE; MUSHET, ROBERT FORESTER.

**SPIESS, shpees, ADOLF** (1810-1858). See PHYSICAL EDUCATION.

**SPIKE.** See INFLORESCENCE.

**SPIKENARD, SPIKE nerd, or NARD.** This plant is a relative of the valerians. It comes from India and yields a costly perfume. The root of the plant is shaped like an ear of corn. A cluster of thick stems about two inches long grows from the top of the root. This part is the main source of the perfume. Precious ointment of spikenard is mentioned in many parts of the Bible. The odor of spikenard is not particularly pleasing to Western peoples, but Oriental peoples prize the perfume. The Romans used spikenard ointment in their baths.

An aromatic herb growing in southern Canada and the northern United States is called *American spikenard*, or *Indian root*. It is a member of the ginseng family, and is used in making a tonic.

H.N.M.

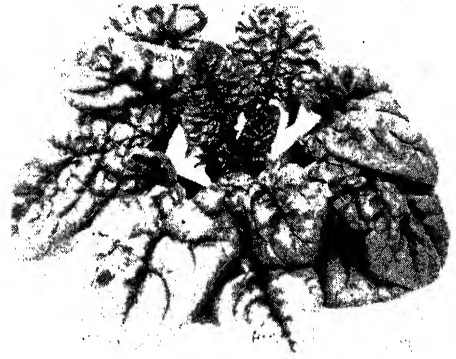
**Classification.** The oriental, or "true," spikenard is *Nardostachys jatamansi* in the *Valerianaceae* family. The American species belongs to the *Araliaceae* family. Its name is *Aralia racemosa*.

**SPILLWAY.** See DAM.

**SPINACH; SPIN ich,** is a low annual plant which produces a thick cluster of wide, thickened, succulent leaves. The leaves are eaten raw or cooked. Spinach is related to beets, Swiss chard, and the common pig-weeds.

Spinach comes from northern Asia, and was once used by the Persians as medicine. It was grown in England as early as 1538, and was known in America by 1806. In Europe it was a special dish for many years, eaten only on feast days.

Spinach is a rapidly growing annual plant which matures in the cool season. It is very easy to grow. The plant does best in a fertile, sandy loam. It does not



#### Leaves of Spinach Are Rich in Minerals and Vitamins

grow well in an acid soil. It is very hardy to frost, but can stand little summer heat. The seeds are sown as soon as the ground can be worked in the spring. The crop is ready for harvest in about three months. A crop can also be easily grown in the late fall.

Spinach is very high in vitamin value and in minerals, although many authorities now agree that the iron in spinach is not in a form which the human body can use. It is an excellent source of the vitamins A and C, and a fair source of Vitamin B. It also has a large amount of fiber, and acts as a mild laxative.

L.A.S.

**Classification.** Spinach belongs to the family *Chenopodiaceae*. Its scientific name is *Spinacea oleracea*.

**SPINAL ANESTHESIA.** See ANESTHESIA.

**SPINAL CORD AND SPINAL NERVES.** See NERVOUS SYSTEM (Parts of the Nervous System); SPINE.

**SPINE.** The spine includes the spinal column and the spinal cord. The spinal column is made up of the bones called vertebrae, and the spinal cord is the largest nerve trunk in the human body. The spinal column surrounds the spinal cord. The spinal cord is composed of gray and white matter. Between the spinal cord and the spinal column there are three membranes which are continuous with membranes surrounding the brain. These membranes are known as *meninges*. A liquid known as the spinal fluid is contained in the cavity between these membranes. When the membranes become inflamed a very serious disease known as *meningitis* results.

The nerves to the body branch off from the spinal cord. Injury to the spinal cord often results in paralysis of certain parts of the human body. Doctors may ex-

amine the spinal fluid in order to diagnose disease. The fluid is withdrawn by means of a thin needle. Doctors



Cervical

Dorsal

Lumbar

Sacral

Coccyx

#### Divisions of the Spine

the *harpsichord* are modified forms of the spinet. See also PIANO.

**SPINGARN, JOEL ELIAS** (1875-1939), was an American publisher and literary critic. He did much to introduce the works of noted European writers to American audiences.

He was born in New York City and studied at Columbia College (now Columbia University). After his graduation he taught English literature at Columbia, but was dismissed in 1911 after a disagreement with President Nicholas Murray Butler. During World War I, he served in France, and returned to join the staff of the publishing firm of Harcourt, Brace and Company. There he edited the works of many modern European writers.

From 1913 until his death, Spingarn was a leader in the National Association for the Advancement of Colored People. He founded the Spingarn medal in 1913.

See also NATIONAL ASSOCIATION FOR THE ADVANCEMENT OF COLORED PEOPLE; SPINGARN MEDAL.

**His Works** include *A History of Literary Criticism in the Renaissance*; *The New Criticism*; and *Poetry: A Religion*.

**SPINGARN MEDAL** awards were instituted by the late Joel E. Spingarn, chairman of the board of directors of the National Association for the Advancement of Colored People, in 1913. The awards are in the form of gold medals and are given each year to the Negro who, according to the board, shall have reached the highest achievement in his field of activity. See also NATIONAL ASSOCIATION FOR THE ADVANCEMENT OF COLORED PEOPLE; SPINGARN, JOEL ELIAS.

may also insert anesthetics into the spinal canal in order to make various parts of the body insensitive to pain. Such a method of using anesthetics is used in caudal anesthesia, which results in more or less painless childbirth.

A.B.H.  
See also MENINGITIS; NERVOUS SYSTEM; SKELETON; VERTEBRA.

**SPINET**, *SPIN* *et.* The spinet was one of the earliest keyboard musical instruments. In shape it was much like a miniature grand piano. Its wire strings were plucked by quill, ivory, or wooden plectra attached to the keys, producing a weak, tinkling sound much like that of a music box. The spinet was probably named after Giovanni Spinetti of Venice, Italy, who made important changes in the design of the instrument in the 1500's. The *virginal* and

C.B.R.

#### THE SPINGARN MEDAL WINNERS

YEAR	MEDAL WINNERS	FIELD OF ACHIEVEMENT
1915	Ernest E. Just	Research in biology
1916	Charles Young	Organization of the Liberian constabulary
1917	*Henry T. Burleigh	Creative music
1918	William S. Braithwaite	Literature
1919	Archibald H. Grimke	Politics and literature
1920	*William E. B. Du Bois	Founding of Pan-African Congress
1921	Charles S. Gilpin	Drama
1922	Mary B. Talbert	Leadership in creation of Frederick Douglass Shrine
1923	*George W. Carver	Agricultural chemistry
1924	*Roland Hayes	Concert Singing
1925	*James Weldon Johnson	Literature
1926	Carter G. Woodson	History
1927	Anthony Overton	Life insurance
1928	Charles W. Chestnutt	Literature
1929	Mordecai W. Johnson	Education, Howard University
1930	Henry A. Hung	Education in the South
1931	Richard B. Harrison	Drama
1932	*Robert R. Moton	Educational work in Haiti and the South
1933	Max Yergan	Interracial work in South Africa
1934	William T. B. Williams	Education, Tuskegee Institute
1935	*Mary McLeod Bethune	Education, Bethune-Cookman College
1936	John Hope	Education, Atlanta University
1937	*Walter White	Civil rights
1938	*Marion Anderson	Concert singing
1939	Louis T. Wright	Surgery and civic affairs
1940	*Richard Wright	Literature
1941	A. Philip Randolph	Labor and civic affairs
1942	William H. Hastie	Equal justice for Negroes
1943	Charles R. Drew	Surgery and blood-plasma development
1944	*Paul Robeson	Singing and acting
1945	Thurgood Marshall	Equality before the law
1946	Dr. Percy Julian	Commercial chemistry
1947	Channing H. Tobias	Civil liberties

\*Asterisk means that the winner has a biographical sketch in THE WORLD BOOK ENCYCLOPEDIA.

**SPINNERET.** See SPIDER.

**SPINNING.** The making of threads by twisting together plant or animal fibers is one of the most ancient arts. For thousands of years yarn was spun by means of a spindle. This was little more than a smooth stick from nine to fifteen inches long. It has a notch at one end for catching the thread, and a stone or baked clay bowl, called a *whorl*, to help make the spindle spin somewhat like a top. The spinner turned the spindle by rolling it against the thigh. The spinning movement twisted the loosely spun yarn into tight thread. With such crude spindles, the ancient Egyptians made threads which were woven into cloth of the finest quality.

The ancient spinners of India and South America used finer spindles which usually rested in a bowl or on the ground. The cotton was spun from combed rolls. Wool or flax fibers were wound in a loose coil around a stick called the distaff.

The **Spinning Wheel** was invented about 1550. It was

the first mechanical arrangement for giving a spinning movement to the spindle. The principle was the same as the hand spindle, but the spindle was mounted horizontally. It was turned by a band or small belt which passed over a groove in the spindle and was connected to a large wheel. The wheel was turned by a foot pedal. The material to be spun was carried on a distaff. The material was drawn off the distaff by hand, and the fineness of the thread depended on the speed with which the twisting thread was drawn out. For very fine thread, two spinnings were necessary. This early type of spin-



Canadian Pacific Railroad

**A Foot Treadle** operates the old spinning wheel, by which flax was slowly turned into thread for weaving cloth.

ning wheel was used by New England housewives in colonial times. It was as common then as the sewing machine is today.

**The Spinning Jenny** was invented about 1764 by James Hargreaves of Lancashire, England. The name *jenny* came from *gin*, which was the local word for *engine*. Hargreaves' invention could spin sixteen or more threads at one time. The spindles were placed vertically and were turned by a wheel worked by hand. The spinning jenny was an excellent machine for producing coarse thread, but was not able to produce fine work.

**The Spinning Frame** was a cotton-spinning machine patented by Richard Arkwright in 1769. Until then all cloth had been woven with a linen warp, since no way had been found to spin cotton for the warp threads. Arkwright's frame drew cotton from the carding machine in a fine, hard-twisted thread suitable for the warp.

**The Mule Spinner**, invented by Samuel Crompton in 1779, combined the principles of the spinning wheel and the spinning frame. It was also called the muslin wheel because it was widely used to produce this material.

The mule spinner had forty-eight spindles, and produced yarn that was unusually fine and uniform.

**Modern Spinning Machines** helped to bring about that change in history known as the Industrial Revolution, when machines began to take the place of hand workers. The spinning machines created a demand for more cotton. This need brought about Eli Whitney's invention, the cotton gin. With more thread to weave, the weavers developed better and faster power looms. Then came machines to knit, to make lace, to embroider, to cut out patterns, and to sew cloth into garments.

Cotton spinning in a modern factory is a typical example of most spinning. After the raw cotton has been cleaned and arranged into bunches, or *laps*, of uniform size, it is carried to the carding machines equipped with huge rollers covered with wire teeth. Here the tangled fibers are straightened out and made to lie in straight, even rows. Then the fibers are rolled over and over one another to form *slivers*, which look like loose ropes of soft cotton yarn. A sliver goes through the processes of *drawing*, *slubbing*, and *roving*, by which it is twisted and retwisted and made continually finer and stronger. The fine operations are carried out in the spinning machines, in which the thread is given the required twist, firmness, and strength.

New machines have been invented to spin the old natural fibers, such as flax and hemp, and new machines are being made for other fibers, such as kapok and ramie. Machines may someday be developed which will make cloth directly without first spinning thread, but until that time inventors will continue their efforts to improve spinning machines.

E.C.Bal.

See also ARKWRIGHT, RICHARD, SIR; CROMPTON, SAMUEL; HARGREAVES, JAMES.

**SPINOZA**, *spih NOH zah*, **BARUCH**, or **BENEDICT** (1632-1677), was a Dutch-Jewish philosopher. His philosophy is based on his idea of God, which is entirely different from the Christian idea. Spinoza was a pantheist and believed that God was the universe. Spinoza developed René Descartes' idea that the universe is divided into mind and matter. Mind and matter, or thought and extension, as Spinoza called it, are the only recognizable features of God. These two do not act or depend on one another, but exist side by side. To explain the apparent dependence of mind on matter and matter on mind, Spinoza worked out his theory of "parallelism." He claimed that every idea of the mind has a corresponding physical object in matter, and every object in matter has an idea in the mind. They are not dependent on each other, but on God. Spinoza believed that God controls all things. Therefore, said Spinoza, man should try to understand God and the universe and spend his days in love of God.

Spinoza was born in Amsterdam. His parents had fled from persecution of the Jews in Portugal and had settled



**Baruch Spinoza**, philosopher of the 1600's, taught that God was all-powerful.



in Holland some time before. Spinoza received careful instruction in Jewish theology, but later he broke with the Jewish faith after study of the philosophy of Descartes and Giordano Bruno. The Jews denounced him and forced him to leave Amsterdam.

Spinoza settled in The Hague and supported himself by grinding lenses. He turned down the position of professor at the University of Heidelberg and a pension offered him by Louis XIV of France because he did not want to give up his freedom of thought. Spinoza's life was lonely and was cheered only by the companionship of a few friends. He was a gentle, sensitive man and he refused to accept financial help from his friends. His body, weakened by tuberculosis, could not long stand the strain of hard work and he died at an early age. B.B.

See also ATHEIST; DESCARTES, RENÉ; PANTHEISM.

**His Works** include *Treatise on Theology and Politics* and *The Ethics*.

**SPIRACLE**, *SPI rah k'l*. See INSECT (Internal Organs).

**SPIRAEA**, *spy RE ah*, is the name of a genus of herbs and shrubs in the rose family which bear beautiful white, pink, or rose-colored flowers. Spiraea grows in many parts of the temperate and cold regions of the Northern Hemisphere, and many species are cultivated as ornamental plants.

One of the best known is *Van Houtt's spiraea*, a hardy shrub with thick, deep green foliage. Another is *Thunberg's spiraea*, which has more delicate leaves. The *hardhack*, or *steeplebush*, is a bush which can be planted in masses. Its flowers grow in narrow, crowded clusters. The *plum-leaved spiraea* is the well-known *bridal wreath* (see BRIDAL WREATH). It grows to a height of six feet and has white flowers. Another well-known species is a troublesome weed in New England, where it is called *meadowsweet*.

Spiraeas grow well in good land, but need lots of water and sunlight. Some species are grown by layering, while others may be grown from seeds or cuttings. J.J.L.

See also PLANT (color plate, Some members of the Rose Family).

**Classification.** The genus *Spiraea* belongs to the *Rosaceae* family. *Van Houtt's spiraea* is *S. vanhouttei*. *Thunberg's* is *S. thunbergii*. *Hardhack* is *S. tomentosa*. *Bridal wreath* is *S. prunifolia*. *Meadowsweet* is *S. latifolia*.

**SPIRAL NEBULAE.** See NEBULA.

**SPIRE** is a term used in architecture to describe the top part of a steeple or tower. It is the highest part of a towered building. In early Christian times tall peaked turrets were often placed above church roofs, and in the Middle Ages it became customary to erect them on top of the large church towers also, instead of slightly raised, four-sided roofs. Gradually these structures became taller and more slender. Modern spires usually narrow to a sharp point high above the roofs of their towers, and are often made with eight sides. Among the great spires of the world are those of the cathedral of Ulm, Germany, 528 feet (highest in Europe); of the cathedral at Cologne, Germany, 515 feet (most famous in the world); of Salisbury Cathedral, 406 feet (highest in England); and of the First Methodist Church in the Loop district of Chicago, 556 feet (highest in the United States, but part of an office building). See also CATHEDRAL (illustrations). K.J.C.

**SPIRES**, or **SPEIER**, **DIET OF**. See PROTESTANT.

**SPIRILLUM**, *spy RIL lum*, singular of spirilla. See BACTERIA (Kinds; illustration).

**SPIRIT LEVEL.** See LEVEL.

**SPIRITS OF CAMPHOR.** See CAMPHOR.

**SPIRITS OF HARTSHORN.** See AMMONIA.

**SPIRITUAL.** The spirituals are religious songs which have been made famous by the Negroes of the southern part of the United States. The spirituals have a strong rhythm and are very emotional. Spirituals are especially moving when sung by a group. One or two lines of a spiritual are sometimes sung alone by a leader. A chorus of voices comes in with the refrain. The rhythm is often emphasized by the clapping of hands. Spirituals have often been considered the only truly American folk songs. Almost all other types are based on the folk music of Europe.

The tunes used in spirituals are sometimes said to have come from Africa. Some of them use scales which are still used in Africa. But there are spirituals which have no relation whatever to African songs. These show a direct relation to the results of Methodist and other evangelistic preaching among the poor whites in the South. These "revivals" encouraged "white spirituals" which had a direct relation to the Negro form.

There are no records of early spirituals and their authors. Negro songs were usually sacred, although some were sung while the Negroes worked and rested. The Negroes' love for rhythm and song led them to put their feelings and memories into their singing. Much of the cotton picking, ship loading, and plantation work was accompanied by singing.

Spirituals were little known outside the Southern States until after the Negro was freed from slavery. In 1867 William Francis Allen and Lucy McKim Garrison published a collection of Negro music called *Slave Songs*. The songs included "Climb Jacob's Ladder," "Give Me Jesus," and "I'll Take the Wings of the Morning."

In 1871 spirituals were introduced to other parts of the United States by a group of Negroes called the Jubilee Singers, of Fisk University, Nashville, Tenn. They traveled all through the United States, and to England and Germany. They gave concerts to raise money for their school. Within three years they collected \$150,000. Other Negro schools followed their example. The Negro quartets from Hampton Institute, Va., and Tuskegee Institute, Ala., became famous.

Spirituals are now one of the best-known forms of American music. Such famous singers as Paul Robeson, Roland Hayes, and Jules Bledsoe have helped to accomplish this. Their influence can be heard in such operas as *Porgy and Bess*, by George Gershwin, and *Emperor Jones*, by Louis Gruenberg. Anton Dvořák, the Bohemian composer, used some of the musical characteristics of these songs in his *New World Symphony*.

The spirituals of the slaves were mostly based upon characters and stories from the Bible. The manner in which these stories are told in Negro spirituals shows a colorful imagination and a simple faith. Many slaves thought of themselves as modern children of Israel and looked for a black Moses to deliver them from their bondage. Their songs were warmly appealing and very sincere. Among the well-known spirituals are "Go Down, Moses," "Weeping Mary," "Deep River," "Swing Low,

Sweet Chariot," and "Nobody Knows the Trouble I've Seen."

R.KEN.

See also FOLK MUSIC; HAYES, ROLAND; ROBESON, PAUL.

**SPIRITUALIST.** The Spiritualists believe in the return of the spirits of the dead and in the power of such spirits to communicate with the living. The belief in ghosts has always existed. It was a small change from belief in ghosts to faith in spirits.

Modern spiritualism began in 1848 in Hydesville, N.Y. The mediums were two little girls named Margaret and Katherine Fox. The story is that a man was murdered in their house. The spirit of this murdered man would return at night, and call attention to itself by rapping on the walls and furniture of the girls' room. The children said that the spirit agreed to answer questions by giving one number of raps for "yes" and another for "no." The word of this communicative spirit quickly spread about the countryside.

The children were taken to the city of Rochester and according to the story, the spirit went along. More and more persons now claimed to hear the spirit. Within a few months, the *Rochester Rappings*, as they were called, were a matter of interest throughout the world. Other persons "discovered" themselves to be mediums, and spirits came to rap for them. Thus spiritualism began.

**Séances and Mediums.** The demonstrations made by spirits through a medium are called *séances*. At *séances*, not only raps but also many other things occur. One of them is table tipping. Several persons sit about a small table and hold their hands lightly on its top. Sometimes the table tips back and forth. At other times, it slides about the room. Some persons believe that animal magnetism, rather than returned spirits, accounted for the movements of tables at *séances*. Scientists discovered that neither spirits nor animal magnetism moved the table. They said that it was unconsciously moved by the hand pressure of those who sat about the table. With this discovery, table tipping lost general popularity. But other occurrences were looked for at *séances*. Some of the spirits act like ghosts, and throw things about the room. They cause objects to float, to change, to appear, and to disappear. Such actions, as well as occasions when the spirits assume visible form, are called *physical manifestations*.

Physical manifestations usually occur only at the *séances* held in complete darkness. This makes all kinds of trickery possible. Mediums have been detected in frauds of the most scandalous nature. Throughout the history of spiritualism, mediums have been discovered cheating and have confessed to trickery. They admitted that what occurred at *séances* was not caused by spirits. The manifestations were brought about by the actions of the mediums, or by the work of assistants. Even the founders of spiritualism, the Fox sisters, finally confessed their trickery. These confessions caused most students of the subject to reject all physical forms of spiritualism. Several different organizations of mediums also joined in the disapproval of such actions.

In another type of *séance*, nothing of a physical nature happens. But the spirits are supposed to take possession of the body of the medium. They use the voice of the medium to talk to those attending the *séance*. "Posses-

sion" is a belief much older than spiritualism. But it was usually thought that a demon, rather than a spirit, took possession. The medium is not supposed to know what the spirit, or demon, says. It is difficult to discover whether the medium is possessed, or merely a good actor. Even if it proved to be a spirit talking, the value of its information would be questioned by many persons.

Another type of medium does not claim to be possessed, but claims to hear voices of the spirits even though the voices are not heard by anyone else. Some of these mediums seem to be able to get information which only the spirits of the departed could know. But it has been proved that many of these mediums get their information in various natural ways. Such means have no connection with spirits, and are often dishonest. On the other hand, many such mediums have never been discredited. But at times their spirit's information is most inaccurate. Many persons believe mediums get their information by reading the minds of those who attend the *séance*.

**Reasons for Popularity.** There are several reasons why people attend *séances*. One reason is to have evidence that there is a life after death. Also, some persons receive comfort from presumed contact with the spirits of departed relatives or friends. Most persons attend *séances* to get information about the proper conduct of their own lives. Some go merely out of curiosity.

Many persons believe that spirits communicate with mediums. Some believe there is no evidence that spirits return. Both groups have followers of high ability and honesty. Spiritualism is a difficult field for personal investigation. One who has not made a deep study of trickery will find it impossible to ascertain whether the medium is a fraud.

W.D.W.

See also ECTOPLASM; GHOST; HYPNOTISM; PSYCHICAL RESEARCH.

**SPIRIT WRESTLERS.** See DUKHOBORS.

**SPIROCHETE**, *SPI roh keet*. See BACTERIA (Kinds); DISEASE (Infectious Diseases); VENEREAL DISEASE.

**SPIROGYRA**, *spy roh JI rah*, is the name of a group of fresh-water algae. They form slimy scum in still and stagnant waters.

**SPIROMETER**, *spy RAHM ee ter*, is a device for measuring the capacity of the human lungs. The spirometer consists of an inverted cylinder which can move up inside another cylinder filled with water. The patient fills his lungs as full of air as he can and blows into a tube. The air is collected in the top cylinder, and forces it upward. The number of inches the cylinder moves upward indicates the volume of air in it, and hence the amount of air contained in the patient's lungs. A man's ability to endure the fatigue of powerful exertion for short intervals is related to his lung capacity. J.L.L.

**SPITSBERGEN**, *SPITZ bur gen*, is a group of islands in the Arctic Ocean. They lie about midway between the North Cape of Norway and the North Pole. The Norwegians call the island group Svalbard. It is made up of five large islands and many smaller ones. The main islands are West Spitsbergen, Northeast Land, Edge Island, Barents Island, and Prince Charles Foreland. The island group covers an area of 24,294 square miles, and has a population of about 2,000.

Spitsbergen is a land of icy frozen wastes. There are no

trees. Glaciers move slowly down the mountainsides. The ice is white with sunlight night and day for nearly four months of the year. Giant icebergs float in the bays in midsummer and arctic gales cut the air like knives the year around.

In spite of the arctic climate, many hundreds of persons come to Spitsbergen each year. Fishing boats, mail boats, coal boats, and freighters stop at the islands when the harbors are free of ice. Passenger ships bring tourists to visit in a land only 500 miles from the North Pole. Spitsbergen has been the base for many arctic explorations. Such daring adventurers into the Northland as Roald Amundsen, Lincoln Ellsworth, and Umberto Nobile began their journeys from the icy islands.

Norse Vikings probably visited Spitsbergen, for there is mention of the country of Svalbard in the early Norwegian stories, or sagas. In the Middle Ages the Norwegian kings claimed Spitsbergen and all the arctic regions. In 1596 a Dutch expedition under Willem Barents rediscovered the islands, and Henry Hudson saw the islands in 1607. But no one settled on the islands until much later.

Finally some Norwegians began mining the excellent coal, and in 1894 they shipped a cargo to Norway. In 1905 an American, John Munro Longyear, came to Spitsbergen and began mining coal commercially. He sold his rights to the Norwegian government in 1916. Longyear City (population 660) bears his name. In 1920 Norway's claims to the islands were formally recognized. Nazi troops occupied Spitsbergen during World War II, but British and Norwegian Commandos damaged the mine works so that the Nazis could not mine the coal. Mining is now being done partly by the Norwegians and partly by the Soviets. The Soviet Union has acquired a concession from the Norwegian government. G.L.E.



**The Spirometer Test** shows how much air can be held in the patient's lungs. After he has inhaled as much as possible, he exhales the air through the tube. The lung capacity is determined by the distance the inside cylinder rises.

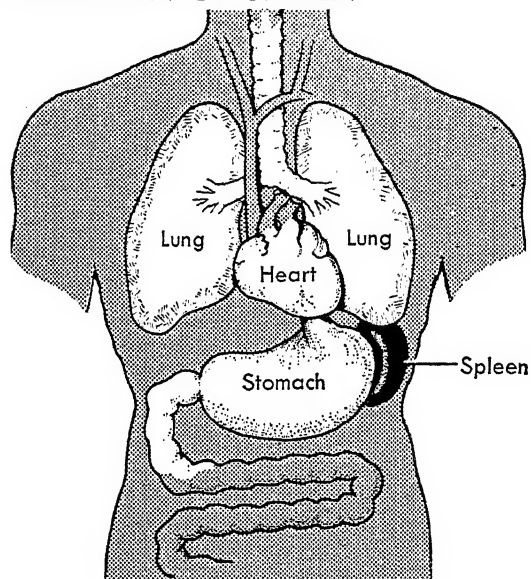
**SPITTELER, CARL.** See CARTER, HELENE.

**SPITZ** is an undersized Samoyed dog. It has a thick white coat, pointed ears, and a sturdy body. Like the other Samoyed, it is a lupine, related to the wolves. It is a northern dog, and carries its tail curled up over its back. It is not recognized as a breed by the American Kennel Club. However, the scientific requirement for a breed in any animal, is that it breeds true to type. S.E.M., JR.

**SPLAY.** See ARCHITECTURE (Terms).

**SPLEEN.** The spleen is the largest gland of the body which does not have a discharging tube. It lies below the diaphragm, to the left of the stomach and a little behind it. In adults the spleen is about five inches long and three or four inches wide, and weighs about seven

## LOCATION OF SPLEEN



ounces. It is soft and spongy, crumbles easily, and is a deep violet-red in color. The organ is covered by a fold of the membrane that lines the abdominal cavity. The principal cells of the spleen are similar to those found in the lymph glands.

The spleen helps to filter foreign substances from the blood, much as a lymph gland filters foreign substances from the lymph. It also acts as a "graveyard" for injured red blood cells. When the body needs extra blood in exercise or hemorrhage, the spleen contracts and squeezes out some of the blood it has stored. It may form red blood cells in unborn babies, but it does not do so after birth.

The spleen is thought to be only a helper of other glands and organs, for it may be removed from the body without any noticeable ill effects. It is often necessary to remove the spleen. Sometimes a disease centers in the spleen and causes it to enlarge. In certain other diseases, the spleen works so hard at destroying worn-out red blood cells that it also destroys healthy red cells and causes anemia. Sometimes it destroys blood platelets, which help in the clotting of blood. When too many

platelets are destroyed, the patient may bleed into the tissues. In all these cases the spleen has to be removed by a surgical operation. A.C.I.

**SPLEENWORT.** See FERN (Classification).

**SPLICING** is a method of joining two ends of rope together without forming a knot. The strands of the rope ends are unraveled several turns. Then the strands of one rope are twisted around the strands of the other. See also KNOTS, HITCHES, AND SPLICES (illustration).

**SPLIT**, or **SPALATO** (population 43,808), is a seaport on the coast of Yugoslavia.

**SPLIT INFINITIVE.** See INFINITIVE.

**SPODE, JOSIAH**, was the name of three famous English porcelain makers, father, son, and grandson.

**Josiah Spode** (1733-1797), the father, is believed to have been born in Staffordshire. As a boy, he was apprenticed to Thomas Wheildon, an experienced potter, but later opened his own plant. Spode started by making only a blue and white porcelain ware, but later began making willow ware, bone china, and other pottery in beautiful shapes and designs. By 1776 he was successful enough to open a branch factory in London.

**Josiah Spode** (1754-1827), the son, mastered the art and craft of pottery making under his father. In the London branch of the factory, he made most of the finest ware that bears the Spode name. His original designs of gold on blue of seaweed, flowers, and birds have seldom been equaled, and no one has ever improved on his discovery of how to combine bone ash with clay to produce a clear, strong bone china. Spode allowed only perfect pieces to leave his factory. All others were destroyed. Many of the tea sets, vases, and plates he made are now prized collectors' items.

**Josiah Spode** (1776-1829), the grandson, learned the pottery business under his grandfather. But in 1803 he lost an arm in an accident and gave up the work. Finally, after his father's death, he went back into the business with William Copeland. The Copeland family has continued to make Spode ware since that time. C.I.J.

**SPOHR, shpohr, LOUIS** (1784-1859), was a German violinist, composer, and conductor. Perhaps his best-known works are the *Violin School* and the opera *Jessonda*. He was born in Brunswick, and began to study the violin when he was five years old. Eight years later, the Duke of Brunswick became his patron. Spohr soon began appearing as a violin soloist, and in 1805 was made leader in the band of the Duke of Gotha. Spohr began to conduct in 1809. In 1822 he was appointed court conductor for life at Cassel. G.B.

**His Works** include violin concertos, symphonies, operas, chamber music, and compositions for voice.

**SPOILS SYSTEM.** The spoils system uses public offices

as political rewards for faithful service. The system is used in many countries. When a new political party comes to power, its leaders place many of their faithful followers in important government offices. This is considered justifiable when able persons are placed in cabinet positions or other high offices where policy is to be made, because the victorious party must shape policies to satisfy its supporters. It is quite unjustifiable when able and experienced persons are dismissed from positions not of a policy-making type in order to make room for others whose chief or only merit is that they are "good party men." This means that the operations of the government are lessened in efficiency.

In the United States, the spoils system came into its greatest use during the presidency of Andrew Jackson. Jackson's friend, William L. Marcy, popularized the slogan, "to the victor belong the spoils of the enemy." By 1840 the "spoils system" was widely used in Federal, state, and local governments. Finally, in 1883 a civil-service law removed some Federal offices from the menace of the spoils system. Since then, much has been done to avoid the evils of this political practice. The Federal civil-service legislation has been greatly expanded, and cities as well as states have introduced similar laws, making education, experience, and other qualifications, rather than political partisanship, the basis of appointment to public office and security in that office. F.F.B.

See also CIVIL SERVICE (History of Federal Civil Service); JACKSON, ANDREW (Spoils System).

**SPOKANE, spoh KAN**, Wash. (population 122,001). This city is the wholesale, retail, railroad, and manufacturing center for the "Inland Empire." This "empire" covers about 150,000 square miles in eastern Washington, northeastern Oregon, northern Idaho, and western Montana. Spokane is the largest inland city and greatest railroad center between the Twin Cities (Minneapolis and St. Paul, Minn.) and the Cascade Range. Spokane woodworking plants produce nearly half of the sashes and doors made in the United States. Nearly all the white-pine blocks from which matches are made in the United States are manufactured in the Spokane area.

**Location, Size, and Description.** The city lies on both banks of the Spokane River near the eastern border of Washington. It is about fifteen miles west of the Idaho boundary. Two waterfalls in the middle of the city furnish water power and add to the scenic beauty. Long Lake Dam, which has a power plant with a capacity of 94,000 horsepower, is near the city. Grand Coulee Dam,

This Sugar Bowl and Teapot Are Examples of the Beautiful Porcelain Ware Made by the Spode Family



about ninety miles west of Spokane, also supplies power.

The city covers forty-one square miles of high land with elevations from 1,890 feet to more than 2,400 feet above sea level. The downtown section is built on the valley plain. The residential districts of Spokane lie on higher land. South of the falls are the deep gorge of the Spokane River and a river branch, Latah (Hangman) Creek. The chief mills and factories are in the eastern and northeastern parts of the city.

Fort George Wright, an army post, is near Spokane. Geiger Field, an army bomber training base, is a few miles southwest of the city. Spokane is the headquarters for United States Army Air Forces operations in eleven states. Galena, ten miles west of the city, is a huge supply and repair base for planes.

**Cultural Life and Recreation.** Spokane is the home of Gonzaga University, Whitworth College, the Academy of the Holy Names, Saint Joseph's School (for boys), and Saint Augustine's School. The Grace Campbell Memorial Museum and a library system with many branches are in the city.

**Recreation.** Spokane has fifty-three parks, which cover an area of more than 2,700 acres. Within a short distance of the city are seventy-six lakes that lie among thick forests and high mountains. The largest lakes are Pend Oreille and Cocur d'Alene. A highway stretches thirty-seven miles from the city to Mount Spokane State Park.

**Industry and Trade.** Spokane is the market place and shipping center for a large farming, mining, and lumbering region. It has meat-packing plants, flour mills, creameries, bakeries, poultry plants, sawmills, breweries, and food-canning establishments. Products made in the city include paper, cement, brick and tile, automobile bodies, aluminum, iron, and, during World War II, magnesium.

**History and Government.** The first settlers came to this region in 1871. The town of Spokane Falls was officially laid out in 1878. It became the county seat in 1882 and the name Spokane was adopted in 1890. The railroad reached here in 1883. In 1889 the business section of the city was destroyed by fire but was soon rebuilt. Spokane adopted the commission form of government in 1910. O.W.F.

See also COMMISSION FORM OF GOVERNMENT.

**SPONGE**, *spunj*. At one time people thought sponges were plants because they do not move around as most animals do. But sponges are a group of sea animals that make up the lowest main division, or phylum, of that part of the animal kingdom which contains the many-celled animals. Sponges have a base or a stem by which they are attached to a rock or some other object on the sea bottom. Some sponges look like plants because their bodies are branched like the bodies of some plants.

Living sponges are varied in color. They may be black, brown, gray, or brilliant shades of red, blue, purple, green, and yellow. Sponges live in abundance from the shallow to the deep seas, and from the equator to the arctic regions. But sponges are most numerous and there are more kinds of sponges in the tropical to warm temperate waters than elsewhere. These waters also are the home of the largest sponges. Commercial

sponges from which our cleaning sponges are obtained grow only in tropical to warm temperate waters.

The ancestors of sponges have existed from the earliest ages. Their remains are found in the oldest rocks that contain fossils.

### The Body of the Sponge

The typical simple sponge is tube-shaped. Countless pores cover its body. Water is taken into the inner cavity of the sponge by the action of the tiny waving hairs, or cilia, with which the cavity is lined. Cells of the sponge having the cilia are able to absorb and digest the tiny sea creatures that the sponge eats. The water is then ejected through a large opening at the top of the tube.

There are more complicated kinds of sponges. Some are grouped together in colonies. The original sponge develops young which remain connected with the parent. As more and more of the individual sponges are developed, their hollow body cavities are united into a complicated network of canals. In these more complicated sponges, the water which contains food and oxygen is sucked in from the outside through the tiny pores. It then goes through canals to the small chambers where the ciliated cells are. These cells absorb food and oxygen. Then the water is poured into the larger tubes, and from them back into the surrounding water.

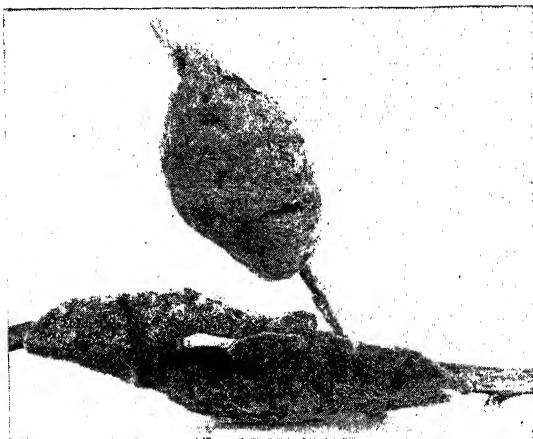
When the sponge settles down on the sea bottom, the skeleton is formed inside the outer layer which gives it its living color. As seen in the ocean, the sponge sometimes looks like a piece of liver. When a sponge dies, the flesh decays and the skeleton of the sponge is left behind. This skeleton may be made up of a substance similar to lime, to glass, or to silk.

Sponges may have many different shapes. In some cases, all members of the same species have about the same shape, but the final form of a sponge is often determined by its surroundings. This is because the soft tissues of the sponge are able to grow over rocks and other substances. In shallow waters which are often disturbed by waves, the shape of the sponges is irregular. The sponges that grow in deep quiet water may be beautifully symmetrical, and are often quite large. Some sponges are thin and flat. Some grow like branching shrubbery or treelike bushes. Some sponges look like fans. Others resemble cups, vases, or slender tubes that may be grouped together in graceful clusters. The smallest sponge may be only a fraction of an inch long. The largest ones may be four or more feet high.

There are three kinds of sponge skeletons. In the kind of sponges called *Calcarea*, the skeleton is made up of needles made of lime, which are called *spicules*. These needles usually have four branches. In the sponges called *Hexactinellida*, there are a great many glassy spicules with fixed points. These spicules are made up of substances containing silicon. Some of the glassy spicules resemble snow crystals and are extremely beautiful. The beautiful lacy Venus's-flower-basket is actually the supporting skeleton of a kind of glass sponge. It is so beautiful that some persons once thought it was made by skilled Chinese or Japanese craftsmen.

The sponges of the third type are called *Demospongiae*. Here the needles are cemented together by a





American Museum of Natural History

**Fresh-Water Sponges** grow in streams, lakes, and ponds. These are incrusts on sticks. Sponges are usually brown or yellow.

flexible silken or hornlike substance called *spongin*. These sponges may contain long needles which are pointed at both ends. In some of these sponges, the needles are very delicate and tiny, and embedded in strands of spongin. In the sponges we use in our bathtubs and for washing woodwork, the needles are entirely absent. There is only a very complicated elastic network of spongin fibers left behind.

Sponges have very poorly developed nervous systems. They are able to react to their environment only in a very slow or incomplete way.

#### Life Story of the Sponge

The sponge begins life as a single-celled egg. This egg divides and continues dividing until it has formed a free-swimming larva which is covered with moving hairs called *cilia*. These cilia move the larva about the sea bottom. The sponge larva finally settles down on the sea bottom and attaches itself to a rock or another object. Then it begins to develop into the adult sponge.

Sponges may reproduce in two ways. One is by sexual reproduction through special cells in the sponge which give off female sex cells or eggs, or male sex cells or sperms. Other sponges may reproduce asexually by growing buds and branches. These buds are sometimes called *gemmules*.

Sponges have very great powers of *regeneration*. That is, they are able to replace lost body parts or even most of the body if it is cut off. Some sponges can be pressed through a very fine cloth so that all the cells in the sponge's body are separated, or left together in very small groups. But if these separate cells are put into water again, they will move about and eventually come together to form a new sponge.

#### Commercial Sponges

Certain kinds of the Demospongiae have very soft and elastic skeletons. These skeletons are very free from impurities and are able to absorb water to a very high degree. These qualities make them valuable for various uses. The finest commercial sponges come from the eastern part of the Mediterranean Sea. They grow off the coast of Syria, off the Greek Islands, and in part of

the Adriatic Sea. The most valuable of these sponges is the Turkey cup sponge. The Turkey toilet sponge, the zimocca, and the honeycomb sponge are also valuable in commerce. The elephant-ear sponge is a thin, flat sponge that is also found in the eastern Mediterranean. Though small, it is very soft and very durable. It is used by surgeons.

Sponge fishing became an important industry in the Americas about the middle of the 1800's. Sponges are fished for off the Florida Keys, and off Tampa Bay and Tarpon Springs on the west coast of Florida. The Bahama Islands in the Atlantic have also become an important source of sponges.

At the present time, nearly all the American sponges come from the Tarpon Springs (Fla.) fisheries. The most valuable sponge from Florida waters is the sheep-wool sponge. This is not so highly prized as the Mediterranean Turkey cup sponge, but ranks immediately after it. It is now the most sought-after sponge on the market. The army and navy use sheep's-wool sponges for gun swabs. They are also in demand for cleaning automobiles. Painters like to use sheep's-wool sponges because they are very soft, very durable, and unusually absorbent.

There are a great many ways of fishing for sponges. In the deeper waters of the Mediterranean Sea, the fishermen use diving suits. They go down below the surface after the sponges, or bring them up by means of dredges. In shallow waters off the Florida coast and in the Bahamas, *hooking* is the method used. Men are sent out in small boats from large vessels. One man manages the boat and the other does the actual fishing. The boat has a glass bottom and the men can look down into the water fifty feet or more. A long pole with a pronged hook at one end is lowered to where the sponges are. The hook is used to loosen the sponges and bring them to the surface.

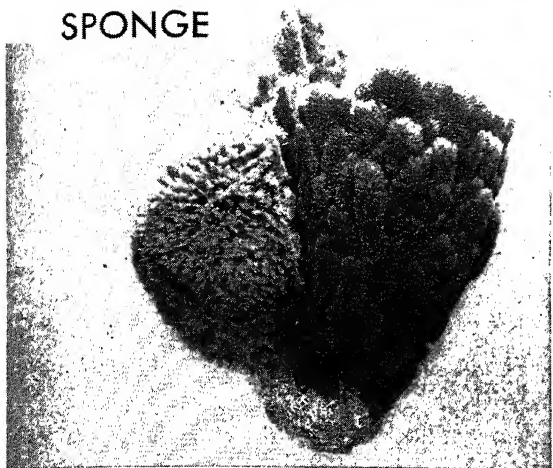
In the deeper waters of the Gulf of Mexico, diving suits are used. Sometimes the divers go as deep as a hundred feet or more in order to get the sponges.



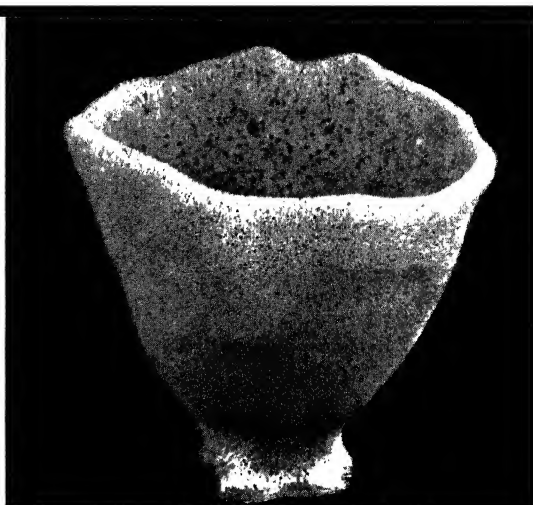
Tarpon Springs Co. of C.

**A Sponge Diver** starts for the bottom, to pull sponges from the ocean floor with a short-handled grappling hook.

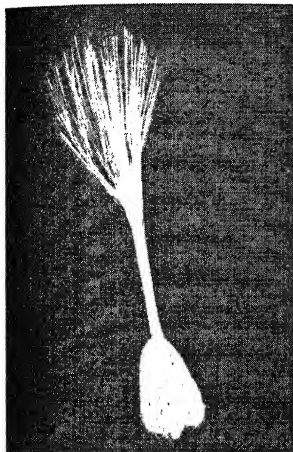
## SPONGE



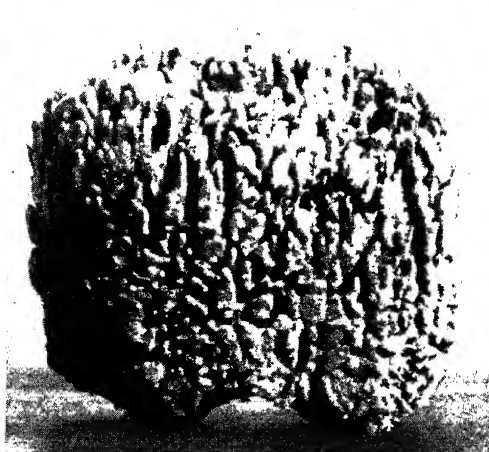
**Sheep's-Wool and Grass Sponges** growing from the same base. Even though they grow side by side, they are quite different.



**The Horny Sponge, or Elephant-Ear**, from the Mediterranean Sea has a very fine texture. It is much used by surgeons.



**The Glassrope Sponge** is a native of the Indian Ocean.



**The Velvet Sponge** lacks the finer texture of the sheep's-wool, but it is satisfactory for rougher cleaning work.



**Venus's-Flower-Basket** is a tube of intricate lacework.



**This Section of a Growing Sponge** shows the strange branchlike formation the sponge follows as it enlarges.



**This Sponge Growth** is like closely twisted branches of a gnarled tree.

Photos: Fish and Wildlife Service; Ralph Buchsbaum; Visual Education Service; American Museum of Natural History

When the sponges are brought aboard they are spread out on deck until the flesh decays. They are frequently beaten to remove all the decaying substances and are then hung in the rigging of the ship to dry. In shallow-water fishing, the hookers keep their catch in pens, or *kraals*, along the shore. The high tide fills these pens with water, which eventually removes the flesh and leaves the skeleton.

R.W.Mr.

See also ANIMAL (color plate, Leading Groups in the Animal Kingdom).

**Classification.** Sponges make up the phylum *Porifera*, which means *pore bearers*. The Turkey cup sponge is *Spongia mollissima*; the Turkey toilet sponge, *Spongia adriatica*; the zimocca, *Spongia zimocca*; and the sheep's-wool sponge, *Hippiospongia gossypina*.

**SPONSOR**, in baptism. See BAPTISM.

**SPONSOR**, in radio. See RADIO PROGRAM.

**SPONTANEOUS COMBUSTION.** See COMBUSTION.

**SPONTANEOUS GENERATION, or ABIOTENESIS,**

*AB ee oh GEN ee sis*, is a theory which states that certain low forms of living matter came into being from non-living material. This theory started among the ancient peoples, who believed that such living things as insects and mice came to life from the mud where they were found in large numbers. It was also believed that worms came from cheese and wood, and maggots from the juices of decaying meat. Later this theory was disproved by scientific experiments. In 1668, an Italian biologist, Francesco Redi, proved that maggots would not breed in meat in which flies were kept from laying eggs. It was shown that complex creatures were produced only by others like themselves. Later, when bacteria and other microorganisms were discovered, the problem of their beginnings again came up. In the middle of the 1800's the theory of spontaneous generation was completely disproved when Louis Pasteur showed that bacteria would not grow in materials which were sterilized. Today, biologists believe that all complex living matter comes from other living matter. But biologists also believe that it is possible that the very lowest forms may have developed through chemical processes from nonliving matter. This development has never been demonstrated or proved under satisfactorily controlled conditions.

G.W.Bz.

**SPOON.** See KNIFE, FORK, AND SPOON.

**SPOONBILL**, a duck. See SHOVELER.

**SPOONBILL.** The spoonbill is a wading bird which looks like an ibis. It has an odd, spoon-shaped bill, which it swings from side to side in the water in search of shellfish, water-living insects, and small crabs. The most beautiful spoonbill is the *roseate spoonbill*, which lives in the warmer regions of the Americas. It has now become rare in Florida, where it was formerly abundant. The neck and the upper back of this bird are white. The rest of the feathers are a rosy pink, turning to red on the outer part of the wings. The roseate spoonbill nests in colonies, and returns year after year to the same place. The nest is a platform of sticks, placed in low trees or shrubs. The female lays five to seven eggs, which are spotted and blotched with olive brown. The finest colonies in the United States are on some of the small islands in the Gulf of Mexico, just off the coast of Texas.

A.M.BA.

**Classification.** The spoonbills belong to the family *Threskiornithidae*. The roseate spoonbill is *Ajaia ajaja*.

**SPOON-BILLED CATFISH, or SPOONBILL CAT.** See PADDLEFISH.

**SPOON RIVER.** See ILLINOIS (Rivers and Lakes).

**SPORE.** A spore is a tiny one-celled body that is able to grow into a new organism. It takes the place of the seed of higher plants. Spores are produced primarily by lower plants, such as the algae, fungi, and bacteria. They may be produced by certain green plants that do not bear seeds, such as ferns and mosses. Certain protozoa, or one-celled animals, of the class *Sporozoa* also form spores.

The spore is so tiny that it can be seen only through a microscope. It is made up of one cell which contains living matter known as *protoplasm*. The cell contains food materials which aid it to grow into a new organism.

There are two types of spores. One type of spore is known as the *sexual*, or *perfect*, spore because it is formed by the union of the so-called male and female sex cells. The second type of spore is formed in various ways without the use of the so-called sex cells. This type of spore is known as the *asexual*, or *imperfect*, spore. The spores of many fungus plants cause disease in crops. There are spores which cause corn smut, cotton wilt, wheat rust, and apple blight. Certain spore-producing, one-celled animals may cause diseases in human beings.

W.C.BEA.

**SPOROPHORE, SPO roh fohr.** See MUSHROOM (Parts of the Mushroom).

**SPOROPHYTE, SPO roh fite.** See BRYOPHYTE.

**SPORRAN, SPAHR an.** See DRESS (Great Britain).

**SPORT**, in science. See EVOLUTION (Variation and Change); FLOWER (How Flowers Reproduce [Hybrids and Sports]).



ank, National Audubon Society

**The Roseate Spoonbill** has beautiful white and pink plumage. Its shovellike bill is well suited to finding its food in the shallow waters of lakes and river beds.

**SPORT.** Sports have an appeal for almost everyone. Next to the weather, people probably talk more about sports than about any other topic. We talk about the coming game, and after it is over we talk about what happened at it. The wide appeal of sports is shown in the large amount of space given to sports in the newspapers and magazines, in the popularity of sports programs on the radio, and in the sports banquets which draw sports followers together in a common loyalty.

Almost any pleasant activity whose main purpose is to exercise the body may be called a sport. What is a sport to one person may be just hard work for another. For instance, a man living in the city might find it sport to go into the forest for a day and chop wood. For the woodsman, such activity would merely be part of his daily routine.

Sports demand a combination of physical strength, an alert mind, enthusiasm, purpose, and teamwork. That is a wide range of accomplishment, but it is one that the American people admire and try to achieve. To Americans, sports are more than amusement. They represent accomplishment for which the body has to be trained, and for which a person must apply himself to become skillful.

Sports represent the spirit of youth even when the sportsman may not be youthful in years. Sports are associated with physical well-being and vigor. They are also associated with mental relaxation in forgetting one's worries and cares.

**Other Values of Sports.** But sports have many other qualities than the mere exercise they give the mind and body. Many friendships are formed through sports, because the ability of people to get along with each other receives one of its greatest tests in sports. Many of the finer qualities of the human spirit are brought out and developed through games. These include leadership and the ability to give and take. The English saying that "Britain's battles are won on the playing fields of Eton" is no idle boast. The qualities that make a great player are much the same as those that make a great leader of men.

But perhaps more important are the qualities that sports develop in making a person a pleasant, well-adapted human being. It is no accident that the term "sportsmanship" is applied to life in general. People like the person who can win gracefully without boasting and who can lose without offering an alibi. Perhaps one of the best definitions of sportsmanship was that drawn up by the Sportsmanship Brotherhood. This code of sportsmanship has eight points.

- (1) Keep the rules.
- (2) Keep faith with your comrade.
- (3) Keep your temper.
- (4) Keep yourself fit.
- (5) Keep a stout heart in defeat.
- (6) Keep your pride under in victory.
- (7) Keep a sound soul, a clean mind, and a healthy body.
- (8) Play the game.

**Types of Sports.** There are almost as many different sports as there are people. Everyone has his own particular ways of satisfying his body's need for exercise. The individual sports which do not depend on other persons for their full enjoyment are perhaps the oldest,

and still the most played, of all sports. There is joy in the simple satisfaction of graceful movement. The small boy finds it in throwing pebbles at a tin can. Later he finds the same joy in pitching a baseball. Men have long found a pleasant release for their pent-up energy in racing along a path or in cutting cleanly through cool water.

But the satisfaction of movement is added to when it is tested against opposition. Such opposition may be from nature, as when a person climbs a mountain or shoots a dangerous rapids in a canoe. The hunter finds his opposition in the cleverness of the wild creature. He may find the opposition even greater and so more sporting if he tries to track down an animal and take its picture. Again, the competition may be against mechanical objects. It may be the archer's struggle to master a bow and arrow, or the bowler's attempt to control his heavy ball. But probably the most common competition is against other persons, either actively in a game or by trying to beat another's jumping or running record.

One of the most common and most sporting forms of competition with other people is the granting of a *handicap* to one's opponent. A handicap is any form of advantage given to an opponent which will make the competition in the event more even. In golf, a handicap takes the form of a few extra strokes added to the score of the better player. In races, a weaker entrant is given a handicap in the form of a head start. In horse racing, a horse with a poor running record is given a handicap by allowing him to be ridden by a jockey of lighter weight than the other jockeys in the race. By the use of a handicap, the stronger opponent in any sport is forced to exert himself to the fullest if he expects to win.

Sports may be individual or team in nature. The individual sports are the ones which best lead to lifelong participation. They are the ones in which sportsmanship is most easily shown, because the player has only himself to consider when he concedes a point. Tennis has always stood out as a game of good manners and gracious conduct. In addition, individual sports appeal more to older people because they are less likely to be of a body-contact nature. In such team games as football and hockey the player must expect to be hit hard and often, and so he must develop greater self-control over his actions.

The sportsman may be either a spectator or a participant. Many people enjoy watching sports almost as much as taking part in them. They find pleasure in watching the smooth performance of a trained athlete, and they enjoy much the same thrill of competition that players do. Fortunately, many people who enjoy watching sports are not content merely to be spectators. They usually find that watching sports makes them only more eager to take part themselves.

**Development of School Sports.** Sports represent a contribution to school life by the students themselves. School sports had their first development under student direction. The early beginnings of school sports programs in the United States were very crude. The students began to play the games they knew to amuse themselves in their free time. College students took the lead in the 1860's and 1870's in playing the English games of cricket and football. They also added track

and field events and interclass contests. It was natural that the colleges should have been the first centers of school sports. The United States was still largely a rural country, and for the most part, young people had chores to do. But the college students were away from home and had no such manual labor. So they found substitutes in the form of gymnastics and active sports, things they could not have done at home had a wood-chopping or farm-plowing job been in sight. Another reason for the development of sports in colleges was that there were few public high schools at that time. So sports programs spread from the colleges to private schools to public high schools. Later, athletics in the elementary schools came into existence. The first Public School Athletic League was organized in New York City in 1903. Sports for girls did not begin on a large scale until after World War I.

**Organization of School Sports.** In the early days of college sports, the students formed themselves into sports clubs on the English pattern. Each club played a different sport and had dues for membership and a set of officers. Then they began to challenge other clubs and outside city teams. In this way intercollegiate sports slowly developed. Cricket gradually changed into baseball. The earliest football was much like its English ancestors, soccer and Rugby. The early track meets had many events familiar today. But they also had such odd events as the ten-mile walk, throwing a sixteen-pound sledge, glass-ball shooting, collar-and-elbow wrestling, wheelbarrow race, fat men's race, and chasing the greased pig. Gradually the novelty events were abandoned in favor of events that really tested speed, strength, skill, and endurance.

The next step was the forming of the sports clubs into one athletic association. Most of the new associations were student-controlled, but in some alumni became managers. Then the school faculties took leadership, and finally a number of different school associations joined together into a conference. One example is the Western Conference which was organized in 1895.

These conferences faced a number of problems in organizing and standardizing school sports programs. There were three main problems.

**Correcting Undesirable Practices.** In the early days of school sports, sports clubs solicited money to support their teams. They found that winning teams attracted large crowds, so they sought good players. The first solution to the evils that grew up was for the faculty to take control of the sports program and to try to eliminate professionalism. Later the conference set up standard regulations for the eligibility of players and secured power to enforce their rules.

**Creating Athletic Standards.** The early sports clubs followed no set pattern of practice and had no medical supervision of players. They followed very loose standards. Faculty and conference control of sports has done much to set up valuable standards for the sports program. The faculties have made sports a part of the general program of promoting school spirit. They have also used sports to teach sportsmanship. Schools have shown increasing consideration for the welfare of the players, who now are given medical examinations, have protective equipment, and are trained under super-

vision. Formerly, coaches were usually volunteers. Today, they are graduates of a course in physical education with a full understanding of how to treat growing bodies and how to conduct sports on a healthful basis.

**Athletics for All.** Early sports programs were limited largely to school teams on which only the trained athletes played. Educators came to realize that these teams did not serve the needs of the student body as a whole. As a result, intramural athletics came into being. At two universities, the University of Michigan and Ohio State University, intramural sports programs began as early as 1913. In the 1920's and 1930's intramurals became an important part of every school program.

From these programs, interest in sports has increasingly spread out to all the people. Each sport now has a national association to promote interest in it. Crowds at baseball, football, wrestling, and horse-racing events are rapidly outgrowing the arenas built to hold them. And the numbers of spectators who want to take part in sports are growing even more rapidly. Bowling, golf, baseball, and basketball are the games most played, while swimming, fishing, hunting, and camping are the most popular outing sports. The national expenditure for sports is very great.

Communities are realizing their responsibility in encouraging sports by building playgrounds, playing fields, and gymnasiums. The state and national governments are also doing much to help the sportsman. State forests and state parks have not been set up to satisfy a future need but rather a present and urgent one. Here persons of all ages can share in outdoor sports. State conservation departments stock their streams and lakes with fish. Camping areas and lodges attract the tourists who do not own private lodges. The Federal Government in setting up national parks and forests has not only preserved scenic beauty, but has also greatly added to the opportunities of the sports enthusiast for summer and winter sports, as well as hiking, sightseeing, and relaxation.

E.D.M.

**Related Subjects.** The reader is also referred to:

#### INDIVIDUAL SPORTS

Aquaplaning	Golf	Skating
Archery	Handball	Skeet
Bicycle	Hiking	Skiing
Boats and	Horsemanship	Snowshoe
Boating	Hunting	Squash Racquets
Bowling	Ice Yachting	Swimming
Boxing	Jujitsu	Tennis
Canoeing	Lawn Bowling	Trapshooting
Diving	Prize Fighting	Wrestling
Fencing	Racing	Yachting
Fishing		

#### TEAM SPORTS

Baseball	Ice Hockey	Six Man Football
Basketball	Lacrosse	Soccer
Curling	Polo	Softball
Field Hockey	Rowing	Tobogganing
Football	Rugby	Volley Ball

#### UNCLASSIFIED

Amusements, Public (with list)	National Park (How the Service Operates)
Canada (Recreation and Outdoors)	Physical Education (with list)
Game (with list)	Stadium
	Track and Field (with list)



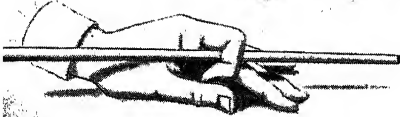
# SPORTS



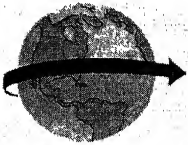
## SPEED IN SPORTS



The fastest pitched ball on record traveled 98.6 mph. This is about the same speed a puck travels when struck by an ice-hockey player.



A billiard ball travels 22 mph.  
A good sprinter runs 20 mph.



The earth's rotation has an effect on a thrown object. A shot put thrown to the east will be shorter than one thrown to the west, because of the effect of the earth's rotation.



The speed of a golf ball is about 130 mph as it leaves the club head after a drive. The club head itself moves at 115 mph.



## HOW THE EARTH'S GRAVITY AFFECTS SPORTS

The force of gravity is weaker at the equator than in northern latitudes.

The force of gravity is weaker on a mountain at sea level.

A shot-put thrown 50 feet in Finland would travel an inch farther in Rome, farther at the equator, and even farther on a high plateau on the equator.



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er would leap 3/4 inches farther  
he would in Massachusetts.



**SPORTSMANSHIP** is playing hard to win in a game but losing well if you have to lose. Good sportsmanship involves such matters as fair play, keen rivalry but careful observance of rules, courtesy, and a generous attitude toward an opponent.

**SPOTSylvania**, *SPOT sil VA nih ah*, **COURT HOUSE, BATTLE OF.** See **WAR BETWEEN THE STATES** (Principal Battles).

**SPOTTED ALDER.** See **WITCH HAZEL**.

**SPOTTED FEVER.** See **TYPHUS**.

**SPOTTISWOODE, ALICIA ANN** (1811-1900), was a Scottish writer of words for songs. Her best-known song is "Annie Laurie." It was first published in 1838, and became popular during the Crimean War. Alicia Ann Spottiswoode was born at Spottiswoode, in Berwickshire. G.B.

**Her Works** include the words to "Farewell to Thee" and "Douglas Tender and True." "The Banks of Loch Lomond" is often credited to her.

**SPRAGUE, FRANK JULIAN** (1857-1934). See **STREET-CAR**.

**SPRAIN** is an injury in which the ligaments are torn, either in part or completely. The ligaments are stringy bands which hold the bones of a joint together. The word "sprain" is sometimes wrongly used instead of "strain," which is the term for an injury in which the ligament is stretched but not actually torn. A sprain is a common injury which may occur at any joint, but usually occurs in the ankle and wrist. It may be caused by a sudden movement or fall, which stretches the ligament and causes it to tear. When a sprain occurs, blood or fluid gets into the joint. This causes swelling and pain. Whenever a sprain is severe, the treatment should be by a physician. Sprains, particularly in the ankle, are very common among football players. P.R.C.

**SPRAT** is one of the smallest sea fish in the herring family. It is only three to six inches long, and lives in shoals along the Atlantic and Mediterranean coasts of Europe. Sprats are often mistaken for young herring. But sprats can be recognized by the sharply notched edge on the abdomen. Sprats are caught in great numbers with bag nets or seines. They make a cheap, wholesome food, and are eaten fresh, smoked, or pickled in brine. I.P.S.G.

**Classification.** The European sprat is classified as *Clupea sprattus*.

**SPRAYER.** See **FARM MACHINERY** (Kinds of Farm Machinery).

**SPRAY GUN.** See **AIRBRUSH**.

**SPRAYING** is a method of killing garden pests by means of a poisonous mist. Insect poisons are of two sorts, those that kill on contact, and those that the insect must eat in order for them to kill. Pyrethrum, nicotine sulfate, and DDT are familiar contact poisons, and are often used on sucking insects. Arsenic salts, such as lead arsenate and calcium arsenate, are familiar stomach poisons used on caterpillars and beetles. Kerosene mixed with soapsuds is effective against some insects because it stops up their breathing pores.

Whatever the poison used for spraying, it must be made into a fine mist before it reaches the insects. This is done with a special kind of pump called a sprayer.

There should be little wind at the time when the

spraying is done, for wind will blow the poison mist away before it can settle on the insects and their food. Spraying should not be done when there is a likelihood of rain within the next day or two because rain washes off the poison before it can do its work. A.St

See also **FRUIT AND FRUIT GROWING** (Fruit Growing in the United States); **FUNGICIDE**; **INSECTICIDE**.

**SPREAD-EAGLEISM.** See **JINGO**.

**SPREADING DOGBANE.** See **DOGBANE**.

**SPREE RIVER.** This German waterway passes through Berlin. The Spree rises near New Salza in the state of Saxony, and flows across eastern Germany in a northerly direction for 220 miles. It empties into the Havel River. About fifty miles upstream from Berlin, the Spree divides into many small streams, and cuts the land into hundreds of islands. Although the Spree is small, the river is extensively used for water traffic. It is connected with the Oder River by a canal. G.B.Gr.

**SPRING.** A spring is a natural fountain of water which flows from the ground in a steady stream. During a rain, part of the rain water seeps into the ground, filtering through the pores and cracks in the soil and in the layers of rock beneath it, until it reaches a layer through which it cannot pass. More rain adds more water. The water that is held in this way in the pores and cracks of the rock layers underground is called *ground water*. The ground water rises higher and higher until it finds a way out to the surface. When enough water flows from the

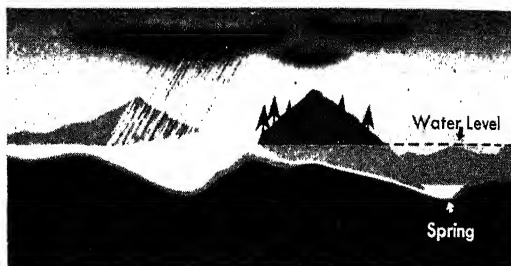


Diagram Showing How a Spring Is Formed

ground to make a steady trickle or stream, it is known as a spring.

Springs are found in mountains, hills, and valleys. Springs are especially common at the foot of a cliff or slope. Some flow, however, from the side of a cliff or even from a hilltop. Hundreds of springs pour from the walls of the famous Snake River Canyon in Idaho. These springs have been used as a source of power.

The largest springs are found in limestone regions where the water flows underground in caves and cave-like channels. Where such channels reach the surface, great quantities of water may pour from the ground. Famous limestone springs, for instance, are found in Florida. See **FLORIDA** (Other Interesting Places to Visit).

The temperature of a spring depends on the temperature of the rocks through which its water has flowed. The warmth of summer and the cold of winter are felt only a few inches or feet below the surface. Ground water that flows so close to the surface yields springs that are warmer in summer than in winter. Springs that come from farther down are always cold.

Deep down in the earth, however, all rocks are hot,

and in volcanic regions hot rock may even lie close to the surface. From this it follows that springs that get their water through cracks from depths of thousands of feet, and many springs in volcanic regions, are hot.

Many springs contain much mineral matter in solution which the water dissolved from the rock layers as it passed through them. They are known as mineral springs. Some mineral springs have become famous as health resorts because the water is said to relieve certain diseases. Examples of such health springs are found in Mount Clemens, Mich.; Saratoga Springs, N.Y.; and in Hot Springs National Park, Arkansas.

W.H.Bu.

See also GEYSER; HOT SPRINGS; MINERAL WATER.

**SPRING** is the quality of a material that causes it to "spring" back after being moved. A metal piece that resumes its shape after it has been bent is called a spring. Nearly all springs are made in the shape of a flat or cylindrical spiral, or are otherwise curved. The common materials used for springs are steel and bronze. Most materials have the quality of elasticity, which is the ability to resume a shape after being bent or pulled by an outside force. Some of the alloys of iron possess elasticity to such a marked degree that they are used for making springs. Although elasticity can be exerted in many ways, springs are generally made to take advantage of the elasticity of torsion, or twist. When a length of wire is coiled and annealed and hardened in that position, any effort to elongate or compress the coil causes a twist in its material, which the spring promptly resists.

Springs are extensively used in machinery. We have watch springs, shock-absorber springs, door springs, and valve springs. Some springs react slowly in assuming their normal position after being compressed. Others, like the springs in a rifle, move out quickly when they are released. The rate of the return of a spring depends upon the force of return and the amount of material which is to be moved. Valve springs are the very heart of an airplane engine, for they must retain their elasticity while hot and work for a long time without failure. A plane's ability to hold its flying speed depends on its engine valve springs working steadily.

Before World War II, the Germans developed an unusually efficient iron-beryllium-magnesium alloy valve spring for their airplanes. This spring enabled their bombers to stay in the air for long periods of time. L.M.

See also ELASTICITY.

**SPRING** is the season of the year between winter and summer. In the Northern Hemisphere, spring begins on March 21 and lasts until June 21. On March 21 the sun crosses the equator and starts northward. As it travels north, its rays strike the northern countries more directly each day, and the weather grows steadily warmer. In the Southern Hemisphere, spring begins in September and ends in December.

Spring is the time when life begins again in nature. Birds return from the South. Trees become leafy again, and flowers begin to bloom. The farmer plants his crops. In many countries, the people have festivals celebrating spring.

G.HUM.

See also APRIL; BIRD (Bird Travelers); JUNE; MARCH; MAY.

**SPRING BALANCE.** See BALANCE.

**SPRING BEAUTY** is the name of a wild flower which grows in forests from Nova Scotia to Georgia and from Saskatchewan to Texas. Its long, narrow leaves grow from a stem six to twelve inches high. Of its two species, the more common Virginia type bears a delicate white and pink flower with bright red veins. It blooms so early that it is often called Mayflower or good-morning-spring. The Carolina type has white blossoms. The spring



J. Horace McFarland

**Spring Beauty is a fitting Name** for these cheerful wild flowers that brighten the forest glades in early May.

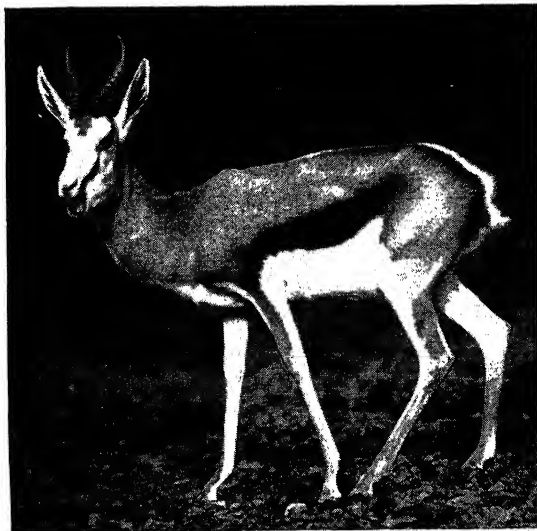
beauty is fertilized by bees and butterflies. R.C.S.

**Classification.** The spring beauty belongs to the Purslane (*Portulacaceae*) family. The Virginia type is *Claytonia virginica*, the Carolina is *C. caroliniana*.

**SPRINGBOK**, or **SPRINGBUCK**, is an antelope which lives in the open plains of South Africa. It closely resembles the true gazelle, and is named for its habit of springing up into the air. When the springbok is frightened, it sometimes springs stiff-legged up into the air eight or ten feet, and then races off at high speed. A fringe of long hairs in the middle of its back stands erect when the animal is frightened.

The springbok is graceful and slender. It stands only about two and one-half feet high and weighs seventy or eighty pounds. It is bright brownish-red, with a white face, and white on the under parts and the inner sides of the legs. Both the male and female have horns which are fourteen to seventeen inches long and gracefully curved in the shape of a lyre.

Springboks were once very numerous. When they migrated to find grazing land and water they sometimes ruined crops and grazing lands. They even lured whole herds of farm animals away with them. The Dutch settlers of South Africa called them *trekbokken*, which



N.Y. Zoological Society

The Springbok of South Africa is one of the most graceful and nimble members of the antelope family.

means *traveling bucks*. Great numbers of them have been destroyed. V.H.C.

**Classification.** The springbok is classified as *Antilocapra americana* in the *Bovidae* family.

**SPRINGER.** See ARCH (illustration).

**SPRINGER SPANIEL.** See DOG (color plate, Sporting Dogs).

**SPRINGFIELD.** See RIFLE.

**SPRINGFIELD, Ill.** (population 75,503). This state capital is the center of a rich farming region and of an important coal field. From 1837 to 1861 it was the home of Abraham Lincoln, whose house and tomb are visited by thousands of persons every year. Springfield lies in central Illinois, about 185 miles southwest of Chicago and about 100 miles northeast of St. Louis.

**Industry.** Springfield has been a mining center since 1865. It also became an important manufacturing center during the 1900's. Springfield factories produce electric meters, tractors, garage equipment, farm implements, road-working machinery, and heavy-duty steam boilers. Flour milling and the processing of soybeans are important industries.

Lake Springfield, a large artificial lake, furnishes an adequate supply of water for industrial purposes and for the generation of electric current, as well as recreational facilities and fine homesites.

**History.** Springfield was founded in 1821, when it was also chosen as the county seat of Sangamon County. In 1837 it was designated the capital of Illinois, but the state offices were not moved there from Vandalia until 1839. The original statehouse, closely associated with Lincoln, Douglas, Grant, and other famous Illinoisans, is now the Sangamon County courthouse. The cornerstone of the present Capitol was laid in 1868. Since then the growth of the state government has led to the erection of several other state buildings. The state fair grounds, used by the Army Air Forces during World War II, adjoins the city on the north.

Oak Ridge, Springfield's cemetery, is widely known

as the burial place of Lincoln. His tomb, an impressive monument designed by Larkin G. Meade, was dedicated in 1874. It was extensively remodeled in 1931. The mausoleum in its base holds the bodies of Lincoln, Mrs. Lincoln, and three of their four sons.

The Lincoln home, at Eighth and Jackson streets near the center of the city, is a two-story frame structure which the Lincoln family occupied from 1844 to 1861. Both home and tomb are maintained by the state.

The state also maintains an outstanding Lincoln collection in the Illinois State Historical Library, located in the Centennial Building. In New Salem State Park, twenty miles northwest of Springfield, the pioneer village in which Lincoln lived from 1831 to 1837 has been completely reconstructed.

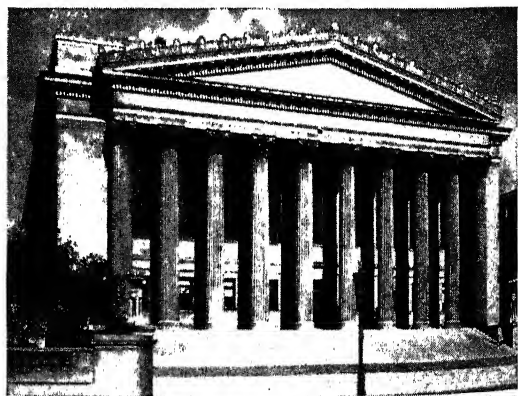
P.M.A.

**SPRINGFIELD, Mass.** (population 149,554). This industrial city is the largest in western Massachusetts. Springfield is also noted as the home of a United States Armory. It lies on the east bank of the Connecticut River about six miles from the Connecticut state line. Springfield is about 100 miles southwest of Boston and about 137 miles northeast of New York City. The cities and towns of Chicopee, Ludlow, Longmeadow, Agawam, and West Springfield are considered part of the Greater Springfield area.

Springfield has many buildings of excellent architecture, and tree-shaded streets lined with attractive homes. The park system covers about 2,000 acres. Forest Park, the largest, contains one of the best collections of water plants in the United States.

Educational institutions in Springfield include Springfield College, the American International College, and the High School of Commerce. Other institutions include the Museum of Fine Arts, the George Walter Vincent Smith Art Gallery, the Museum of Natural History, and the William Pynchon Memorial Building.

**Industry and Trade.** Springfield is an important manufacturing and retailing center. The city's manufactures include firearms, cutlery, bicycles and motorcycles, railroad cars and supplies, electrical machinery, foundry and machine-shop products, cotton and knit goods, brass and bronze products, and meat. Printing and publishing is an important activity in Springfield. *Webster's International Dictionary* is published here. The city is also headquarters for a number of insurance



Ewing Galloway

Auditorium of the Civic Center in Springfield, Mass.

companies operating throughout the United States. Springfield is a transportation center for western New England, and also has a considerable amount of trade with New York City.

**History.** The first settlement on the site of Springfield was made in 1636 when about a dozen families established homes at the meeting point of the Connecticut and Agawam rivers. Later the settlement moved across the Connecticut and settled on its east bank. The settlement was almost entirely destroyed by fire when Indians attacked during King Philip's War in 1675. The settlement was soon rebuilt, however, on a larger scale than before.

Springfield was a center of Shays' Rebellion, an uprising caused by the financial depression which followed the Revolutionary War. The rebellion collapsed when Shays' forces failed in an attempt to capture the United States Arsenal at Springfield.

The United States Army was established at Springfield in 1794. The first railroads entered the city in 1835. In 1823 the *Springfield Republican* was established by Samuel Bowles. Its excellent style and liberal editorials made this newspaper a national institution for many years.

Before the War between the States, Springfield was a center of the Abolitionist movement. It was here that John Brown organized the United States League of Gileadites to help slaves flee from the southern states.

Springfield was damaged by floods from the Connecticut River in 1927 and in 1936. Since then great levees have been built to guard against similar floods. W.F.D.

See also AUTOMOBILE (History).

**SPRINGFIELD, Mo.** (population 61,238), is the commercial center for a large farming, lumbering, and mining district. It is the fourth largest city in Missouri. Springfield lies in the heart of the Ozark Mountains in southwestern Missouri. It is about 200 miles southeast of Kansas City, and about 240 miles southwest of St. Louis. It is the gateway to the beautiful White River region.

Fruit is grown in the large orchards near by. Lead and zinc are mined in the mountains and sent to Springfield for processing. The city is an important poultry market. It has flour and lumber mills, machine shops, and iron-works, wagon and trailer factories, meat-packing plants, and clothing establishments. The chief shops and general offices of a large railway line are in the city.

Springfield was settled about 1830. It became a town in 1838 and a city in 1847. The commission form of government was adopted in 1916. Springfield is the home of Southwest Missouri State Teachers College, Drury College, the Central Bible Institute, and Elfin-dale Academy. Hospitals include the Federal Medical Center, the only one of its kind in the world. O'Reilly General Hospital was maintained here by the army during World War II. R.Sc.

See also COMMISSION FORM OF GOVERNMENT.

**SPRINGFIELD, Ohio** (population 70,662), is the home of one of the largest magazine-publishing houses in the world. This is the Crowell-Collier Publishing Company. Nearly twenty million copies of magazines are published every month in Springfield. The city lies in a fertile farming region and is one of the best-known centers in

the world for the production and shipping of rose plants. Springfield was named for the springs that flow out of near-by cliffs.

The city is located in west-central Ohio in the Mad River Valley. It lies at the meeting point of Lagonda Creek and Mad River, about forty miles west of Columbus. It is on the national Old Trails Road, which is now a modern highway that reaches from Washington, D.C., to Los Angeles, Calif. The highway follows Main Street through the heart of the business district of Springfield.

Among the magazines published in the city are the *Woman's Home Companion*, *The American Magazine*, and *Collier's*. Factories in Springfield make farm machinery, engines, leather goods, and a variety of metal products.

Settlers from Kentucky, led by Simon Kenton, established a village in the Mad River Valley near Springfield in 1799. This village was later abandoned for the present one on Lagonda Creek. When Clark County was organized in 1818, Springfield was made the county seat. It received a city charter in 1850. Wittenberg College was founded in Springfield in 1845. Free public schools were opened in 1850. The commission form of government was adopted by Springfield in 1914. W.R.McC.

See also COMMISSION FORM OF GOVERNMENT.

**SPRINGFIELD COLLEGE** is a privately controlled school of liberal arts and science for men, at Springfield, Mass. Women teachers, nurses, and social workers are admitted to the upper classes, to graduate courses, and to summer school. The college has schools of health and physical education, social science, and teacher education. Courses lead to degrees of B.A. and M.A. Springfield College was founded in 1885. The average enrollment is about 500.

**SPRING HILL COLLEGE** is a college of liberal arts and sciences for men, at Spring Hill, Ala. It is operated by the Roman Catholic order of the Jesuits. Courses are offered in the arts, sciences, commerce, and premedical, pre dental, and pre-engineering work. Women are permitted to enroll for the summer sessions. The college was opened in 1830, and has an average attendance of about 700. W.D.O'L.

**SPRING SUSPENSION, INDEPENDENT.** See AUTOMOBILE (Parts).

**SPRING TIDE.** See TIDE.

**SPRINKLER SYSTEM.** Automatic sprinkler systems have put out thousands of fires before they could become dangerous. These systems are made up of pipes carrying water under high pressure. Soft metal plugs are placed in sprinkler heads along these pipes at intervals of about eight feet. The plugs melt at about 165° F. As soon as a fire creates enough heat in a room to melt the plugs, water from the sprinkler heads sprays the surrounding area. At the same time, a bell rings until the water is shut off. Some sprinkler systems are equipped with small stoppers made of quartz, which are lifted out by the heat of the fire, releasing several sprays of water. One type of sprinkler sends out SOS calls by telegraph when a fire starts.

The first sprinkler system was patented in 1872 by Philip W. Pratt of Abington, Mass. His system used cords and fuses attached to a valve. When a fire started, the heat melted the valve, which automatically released a stream of water.



The cost of fire insurance may be reduced 60 to 90 per cent if a building is equipped with a sprinkler system.

J.J.F.

See also BARKER'S MILL; STANDPIPE.

**SPROUTING.** See GERMINATION.

**SPRUANCE, RAYMOND AMES** (1886- ), was one of the most successful American naval commanders in the Pacific in World War II. The naval forces under his leadership caused greater damage to the Japanese with less loss to themselves than did any other American fleet units in the war.

Spruance was born in Baltimore, and was graduated from the United States Naval Academy in 1907. By 1914 he had become a recognized expert on the complicated mechanisms of modern warships. He served as electrical superintendent at the New York Navy Yard during most of World War I.



U.S. Navy

**Admiral Raymond Spruance** led the U.S. Fifth Fleet during part of World War II.

Shortly before the United States entered World War II, Spruance took command of a cruiser division of the Pacific Fleet. This division was part of the force sent out in June, 1942, to stop a Japanese attempt to invade Midway Island. Shortly after the battle began, the force commander's flagship, the *Yorktown*, was put out of action, and Spruance took charge of the battle operations. The victory of the Battle of Midway, which many historians consider the turning point of the Pacific war, established Spruance's reputation as a combat commander. Admiral Chester Nimitz, the Pacific Fleet's commander, made him his chief of staff. In this position Spruance planned many campaigns.

In the fall of 1943, Spruance returned to sea in charge of the operation against Tarawa in the Gilbert Islands. Three months later, as commander of the Fifth Fleet, he directed the successful attacks against the Marshall Islands. In February, 1944, he directed an aerial attack on the great Japanese naval base at Truk in what he called "a partial settlement" for Pearl Harbor. Later that year he won an overwhelming victory in the Battle of the Philippines Sea and commanded the naval forces in the capture of Saipan and Guam.

In February, 1945, Spruance led Task Force 58 on the first carrier strike on Tokyo and directed the capture of Iwo Jima. He was planning the naval phase of American landings in Japan when World War II ended.

After the war, Spruance served for a time as commander of the Pacific Fleet and then became president of the Naval War College.

Many naval experts have rated Spruance as the best American naval combat commander of the war. He was given a large share of the credit for working out the circular battle formation which made American carrier groups the most effective fighting fleets in naval history. He was particularly admired for his calmness and deliberation in action.

Spruance retired from the navy in 1948.

F.S.M.

**SPRUCE** is the common name of a genus of evergreen trees in the pine family. These trees have cones that hang straight downward. Their needles grow thickly in spirals around the branches, pointing in all directions. There are about forty different kinds of spruce trees. All these are native to the Northern Hemisphere. Some grow beyond the Arctic Circle, while others grow as far south as the Pyrenees Mountains in Europe. In North America they grow as far south as North Carolina and Arizona.

Spruces are more closely related to the firs than to any other cone-bearing tree, but the cones of firs stand straight up and their needles grow in flat rows. The foliage of the spruce is also different from that of other cone bearers. The needles are four-sided, or *keeled*, and less than an inch in length. They are joined to the twigs by woody projections which give the branches a rough prickly feel when the needles have fallen. The spruces are very tall trees when full-grown, and usually are shaped like a pyramid. In old trees, the drooping lower branches may brush the ground.

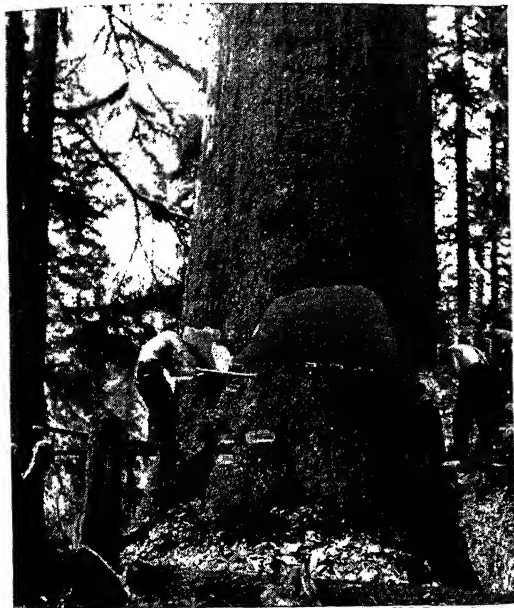
**Kinds.** The *white*, *black*, and *red* spruces of the east and the *Sitka spruce* of the west are the most important commercial spruces in North America. The white and black spruces are named for the general color of the bark and foliage. These spruces are more widely distributed than any other. They grow between Bering Strait on the north, and Maine, New York, and Michigan on the south. The black spruce also grows in high altitudes in Virginia. The trees grow west to British Columbia and Montana.

The white spruce may reach a height of 150 feet. The black is a little smaller. The needles of the white spruce



Devereux Butcher

**Foliage and Cones of the Red Spruce.** The narrow, dark yellow-green crowns of this evergreen pierce the forest skyline of southeastern Canada and northeastern U.S.



U.S. Forest Service

Loggers Fell a Sitka Spruce in the Alaskan Forest

have an unpleasant smell. The red spruce grows between Nova Scotia and North Carolina, west as far as Tennessee. The red spruce may be only a small shrub in the far north, or a tree 100 feet high in New Hampshire and Pennsylvania.

The Sitka spruce grows on the Pacific Coast between northern California and Alaska. It sometimes reaches a great height, especially in the swamps or tidewater re-



J. Horace McFarland

The Silvery-blue Foliage of the Blue Spruce makes it one of the most admired of all the American evergreen trees.

gions. A number of giant Sitkas are over 300 feet high.

The most important spruce in Europe is the *Norway spruce*. This handsome tree is planted in eastern North America as an ornamental. The so-called *Douglas spruce*, or *Douglas fir*, of Washington, Oregon, and British Columbia, belongs to a different genus, but is related to the spruces. It produces almost as much lumber as the redwood, and is almost as large.

**Uses.** Spruce wood is widely used for wood pulp in the papermaking industry. The timber is strong, light, and flexible, and is well suited for masts and spars of ships. It is also used to make boxes and for sounding boards of musical instruments such as pianos, violins, and guitars. Sitka spruce wood has been used in making airplanes and gliders.

Spruce wood is also used for interior finishing in houses. Resin, tannin, and turpentine are products of spruce bark. Beer is sometimes made from young twigs. The gum of the black spruce, which is hardened resin, is another commercial product. Dyes have been made from the turpentine which is taken as a by-product in the manufacture of paper.

J.T.B.

See also CONE-BEARING TREES.

**Classification.** Spruces make up the genus *Picea* in the *Pinaceae* family. The white spruce is *P. canadensis*. The black is *P. mariana*, the red is *P. excelsa*. The Douglas spruce, or fir, is *Pseudotsuga taxifolia*.

**SPRUCE PARTRIDGE.** See GROUSE.

**SPRUE.** See THRUSH.

**SPUN RAYON.** See RAYON.

**SPUR GEAR.** See GEAR.

**SPURGE FAMILY, or EUPHORBIACEAE, 300 FAMILIES.** *A see ee*, is a family of herbs, shrubs, and trees. Many of the plants give us useful products such as castor oil, croton oil, cassava, and rubber. There are about 5,000 different plants in the spurge family. They grow in many parts of the world, especially in the tropics.

Members of the spurge family bear small, inconspicuous flowers, but they sometimes have brilliantly colored flower bracts, or leaves that look like flower petals. A biting milky juice is usually found in the plants. Some species of Africa look almost exactly like a cactus when they are not in bloom. The family also includes a number of ornamentals, such as the poinsettia.

P.C.S.

**Related Subjects.** The reader is also referred to:  
Cassava      Jumping Bean  
Castor Oil    Poinsettia  
Croton      Rubber

Snow-on-the-Mountain

**SPURGEON, CHARLES HADDON** (1834-1892), was one of the greatest English preachers of his time. He was born at Kelvedon, Essex, the son of an Independent preacher. He had an elementary education there. In 1851 he joined the Baptist Church and began preaching near Cambridge. His youthfulness

attracted large audiences, and his clear voice, his rich command of language, and his dramatic abilities held



Brown Bros.

Charles Spurgeon was the most popular English preacher of his time.

them. In 1854 he began preaching in London. Seven years later, the Metropolitan Tabernacle was especially built to hold the huge crowds that came to hear him, and he preached here the rest of his life. Many schools and charitable institutions grew from his work. w.w.s.

**SPUYTEN DUYVIL**, *SPI ten DI v'l*, **CREEK**. See NEW YORK CITY (Location, Size, and Description).

**SPY**. A spy is anyone who abandons the uniform or distinctive badge of his service and mingles with the enemy in order to obtain information of value to the army he is serving. The international rules of war provide that a soldier in uniform cannot be considered a spy, even if he is attempting to obtain information within enemy lines. Civilians carrying messages through battle lines are not considered spies if they do not attempt to disguise their identity. To be condemned as a spy, a person must be captured within the lines of the enemy in disguise, or while representing to be other than what he really is.

The penalty for conviction as a spy is death, usually by hanging or execution by a rifle squad. Spies must receive a trial before punishment is imposed. One of the most famous spy trials was that of Major John André, a British officer who was caught in disguise within the lines of the Revolutionary Army. André was found guilty and hanged because he was not in British uniform while in the American lines. Had he reached the British lines and afterward been captured, he would have been treated as a prisoner of war rather than as a spy, even though the Americans had known that he had acted as a spy.

Professional spies are often hired by countries both in war and peacetime. Professional spies have often been found untrustworthy, however. Since they are paid for each bit of information they supply, they often falsify reports in order to obtain more money. Spies have also been known to be working for both sides in a war. Mata Hari, a famous woman spy of World War I, was considered to have been of doubtful value to her German employers. She was finally captured and executed by the French.

During World War II, the neutral countries swarmed with spies. Cairo, Egypt, and Lisbon, Portugal, were the spy centers of the world. Spies often used small radio transmitting sets to send information to their headquarters. Some spies were also trained as saboteurs. Six German spies who landed on the American east coast from a submarine to gather information and commit sabotage were captured and convicted by a military commission in Washington, D.C. They were executed August 8, 1942. K.D.

See also **ANDRÉ, JOHN**; **FIFTH COLUMN**; **HALE, NATHAN**; **SECRET SERVICE**.

**SPYRI**, *SHPEE ree*, **JOHANNA HEUSSER** (1827-1901), was a Swiss writer of books for children. Her masterpiece was *Heidi*, the story of a little girl in Switzerland. Johanna Spyri was born at Hirzel, near Zurich. She began to write to earn money to help refugees coming into Switzerland during the Franco-Prussian War. Her books were written in German, and were translated into many languages. P.A.W.

Her Works include *Uncle Titus*; *The Little Alpine Musician*; *Cornelli*; and *Mäzli*

**SPY WEDNESDAY**. See **HOLY WEEK**.

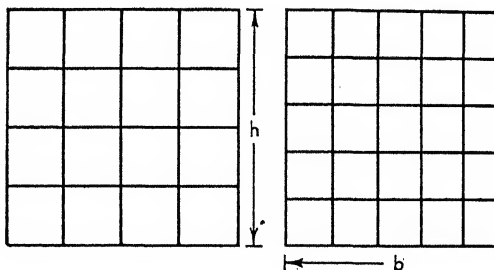
**SQUAB**. See **PIGEON**; **SOUTH CAROLINA** (Agriculture [Livestock]).

**SQUAD**. See **ARMY** (Organization of Army Forces).

**SQUADRON**. In the cavalry of the United States Army, a squadron is a group under the command of a major or a lieutenant colonel, and containing about the same number of men as an infantry battalion (300 to 850). In the Army Air Forces, a squadron is made up of three or four flights of three or four planes each. The ground forces of the air arm are also divided into squadrons which range in size from several hundred to a thousand men. A *naval squadron* is made up of four or more ships of the same type, or six or more naval aircraft. E.Co.

**SQUANTO** (? -1622), also called **TISQUANTUM**, was an American Indian who was friendly to the Pilgrims. He was kidnapped by an English captain at Pawtuxet and sold as a slave in Malaga, Spain. Squanto later escaped and made his way to London, where he lived for two years. In 1619 Squanto returned to New England as pilot with an English sea captain. In 1621 he met the Pilgrims and acted as their interpreter in dealings with the Indians. Squanto taught the Pilgrims the Indian way of planting corn and helped them to live through their first terrible winter at Plymouth. He died the next year. T.R.H.

**SQUARE** is the name of a plane figure having four equal straight sides and having four right angles (see diagram).



The area of a square is the product of its base and altitude, or length times width.  $A = bh$ . But in a square,  $b = h$ , and therefore  $A = bb$  or  $A = b^2$ . This is read,  $A$  equals  $b$  square. If  $b = 4'$ , then  $A = 4^2$  or 16 square feet. If  $b = 5$  units, then the area is 25 square units.

What is the area of a square city block 600' long?

$$A = b^2$$

$$A = 600^2 = 36,000 \text{ square feet.}$$

When the area of a square is known, one side may be found.

What is the side of a square whose area is 144 square feet?

The problem becomes, What number multiplied by itself gives 144? It is expressed

$$x^2 = 144 \text{ or } x = \sqrt{144}$$

The answer, 12, is called the *square root* of 144. The problem is expressed

$$\text{Area of square} = 144 \text{ sq. ft.}$$

$$1 \text{ side in ft.} = \sqrt{144} = 12.$$

H.C.B.

See also **QUADRILATERAL**; **SQUARE ROOT**.

**SQUARE DANCE**. See **DANCING** (Development of the Dance); **FOLK DANCING**.

**SQUARE MEASURE** is the system used in the measurement of surfaces. The unit for the *area* of a surface is the square whose sides are of unit length. Hence the name of the system.

We can describe a table top as being 12 inches long and 10 inches wide, or  $12 \times 10$  inches. But these figures represent only lines, which have just one dimension—that of length. A plane surface has two dimensions—length and width. They must somehow be combined into a single expression. Thus we describe the area of the same table top as 120 square inches.

Square measure of any square or rectangular plane surface is obtained by multiplying length by width. The reason for this is easily seen if we draw a picture of the table top and mark off its inches. A line should be drawn at every inch along the length and at every inch along the width. The two sets of lines will cross each other. This will give us 120 little squares, each measuring one inch in length and one inch in width. The measure of each is called a square inch. The areas in square inches, feet, yards, and so on, of other geometrical figures are found by special rules. These rules are all based on the one stated above.

E.G.St.

See also WEIGHTS AND MEASURES.

**SQUARE ROOT.** The square root of a number is one of the two equal factors of the number. The square root of 16 is 4 since  $4 \times 4 = 16$  or  $4^2 = 16$ . The square root of 49 is 7. This is written  $\sqrt{49} = 7$ . The square root sign,  $\sqrt{\quad}$ , is called a *radical sign* from the Latin word for *root*.

**Finding Square Roots by Inspection.** The square root of 169 is 13 because  $13 \times 13 = 169$ . That is, 13 is one of the two equal factors of 169.

Find by inspection the square root of:

- |         |        |         |
|---------|--------|---------|
| (1) 144 | (3) 64 | (5) 100 |
| (2) 4   | (4) 81 |         |

**Finding Square Roots by Estimate and Average.** This method dates back to a mathematician named Heron of about 200 B.C. The method is still very useful when tables or slide rules are not available.

(1)  $\sqrt{841}$ . Since  $20^2 = 400$  and  $30^2 = 900$ , the square root of 841 is between 20 and 30. It is much nearer 30. If 841 has an exact square root, it must be 29, because  $9 \times 9$  gives a product ending in 1. Now divide 841 by 29 and get 29.  $\sqrt{841} = 29$ .

(2)  $\sqrt{1024}$

(3)  $\sqrt{1066}$

**Step A.** Estimate the square root.  $30^2 = 900$   
 $40^2 = 1600$

Since 1066 is much nearer to 900 than to 1600, choose a number nearer to 30 than to 40, say 33.

**Step B.** Divide 1066 by 33 and get 32.30

**Step C.** Our two factors are not equal. 33 is too large and 32.30 is too small. The "difference is split," and the average is found.  $\frac{33+32.30}{2} = 32.65$ .

**Step D.** Now multiply 32.65 by 32.65 and get, to four figures, 1066. Therefore  $\sqrt{1066} = 32.65$ . This is the square root as close as it can be written with four figures. It is not the exact square root. The exact square root cannot be exactly set down in figures.

(4)  $\sqrt{682}$ . **Discussion.** The method of estimate and average depends on the obvious fact that if a number is divided by its square root, the quotient must equal the divisor. To find the square root of a number, make as good a guess as possible at the result. Now divide the number by the guess. If the quotient is equal to the

divisor, the desired square root is found. If the quotient is larger (smaller) than the divisor, the guess was too small (too large). Repeat the process with a new divisor between the original number and the original quotient. Keep doing this until the divisor and quotient become equal.

In this problem,  $\sqrt{682}$ , the square root is clearly between 20 and 30. Try 25.  $682 \div 25 = 27.2 \div$ . The desired square root is between 25 and 27.2. Try 26.1, halfway between 25 and 27.2.  $682 \div 26.1 = 26.1 \div$ . The process evidently can be carried to as many decimal places as may be desired.

(5) A square garden containing 750 sq. ft. will be how long on each side — to the nearest foot?

(6) The town park department has 100 rose bushes to set out in a circular garden. It allows 5 square feet for each bush. What radius should be used in laying out the circle? Suggestion:

$$5 \times 100 = 22 \sqrt{\frac{2}{7}}$$

$$7 \times 5 \times 100 = 22 \sqrt{\frac{2}{7}}$$

$$\frac{7 \times 5 \times 100}{22} = \sqrt{\frac{2}{7}}$$

Now find the value of the fraction, and then find to the square foot.

**Finding Square Roots by Table** is an easy process which can be learned in half an hour. Either a table of squares or of square roots will do.

The square roots, or any other roots, can be found very rapidly with a table of *logarithms*. Quickest of all is the *slide rule*, which is really logarithms printed on two sliding sticks.

### The Old-Fashioned Method of Finding Square Roots.

The methods already discussed are used in all practical computing. The old-fashioned method has been taught in arithmetic classes, but it is little used outside school. It is much like long division, except that at each step the divisor is changed.

(1)  $\sqrt{324}$ .

**Step A.** Separate the number into two-figure "periods" beginning at the decimal point.

**Step B.** For the first trial divisor, take the square root of the largest perfect square which is less than the first period. It is 1 in this example, because  $1^2$  or 1 is the largest perfect square less than 3. Divide, multiply, and subtract as in long division.

**Step C.** Double the quotient or answer as it now stands for the new trial divisor. Thus  $2 \times 1 = 2$ . Set down the 2 so as to leave a space at its right. Now think "20 goes into 224 eight times." Notice that 9 is too large. Set down the 8 in the blank space and in the answer.

**Step D.** Multiply and subtract.

(2) Find the square root of 4,741 to three-figure accuracy.

$$\begin{array}{r} 68.8 \\ 6 \overline{) 4741} \\ \underline{36} \phantom{00} \\ 128 \phantom{00} \\ 10 \overline{) 1280} \\ \underline{10} \phantom{00} \\ 1368 \phantom{00} \\ 1 \overline{) 1368} \\ \underline{1} \phantom{00} \\ 13765 \phantom{00} \\ 6 \overline{) 13765} \\ \underline{67} \phantom{00} \end{array}$$

$$\sqrt{4741} = 68.9$$

*Step A.* Exactly as in problem 1.

*Step B.* The first trial divisor is 6 because  $6^2$  or 36 is the largest square less than 47.

*Step C.* For the next trial divisor, double the "answer" as it now stands and set it down so as to leave a blank at the right. Now think "120 goes into 1,141 eight times." Set down 8 in two places.

*Step D.* Multiply and subtract.

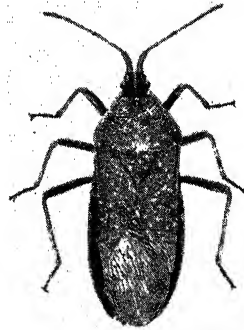
Continue the process. Four figures must be found in the result in order to be sure of the third. H.C.B.

**SQUASH** is the name given to three groups of pumpkin plants. They are all vines and are warm-weather crops, but their growth periods are different and they are used differently. One group includes all summer squash and most of the orange-colored winter pumpkins. The second group includes the straw colored *cheese pumpkins* and the *cushaw* squashes. The third group includes most of the squashes which can be stored over winter.

Summer squashes grow very rapidly. The fruits are harvested while they are very immature. The autumn

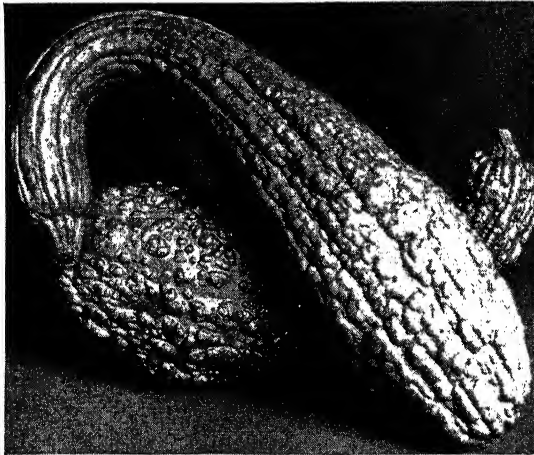
squashes have small fruits. They are harvested when they are almost mature. They can be stored for a few months, but they lose their quality very rapidly. The winter squashes are harvested as soon as mature. They have very hard shells and may be stored indefinitely. The Hubbard squash is perhaps the best-known winter variety. Each of these groups has several types and varieties which differ in size, color, texture, and flavor.

It would be easy to grow squashes if it were not for insects. Seeds are planted in hills about a month before the last frost of spring

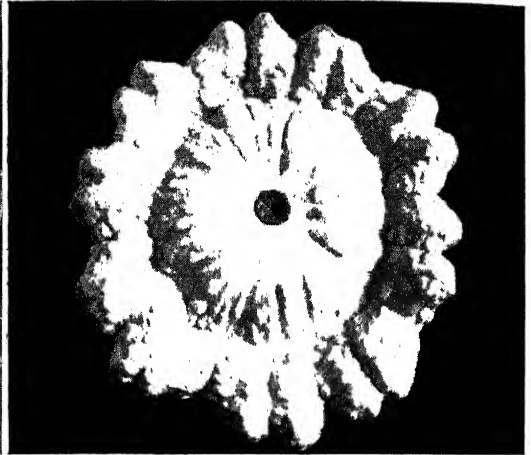


U.S.D.A.

**The Squash Bug**



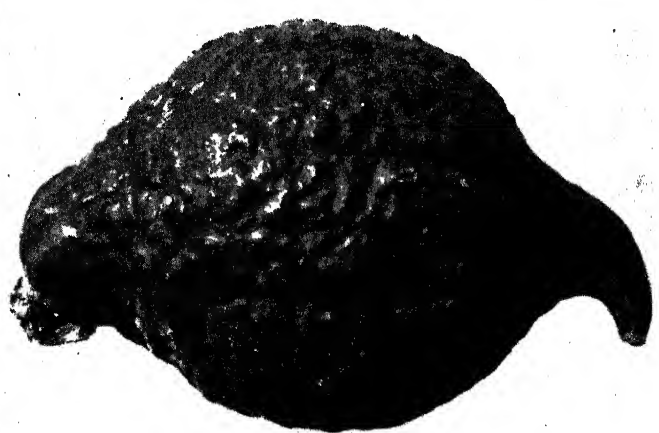
**Giant Yellow Crookneck Squash** has a long curved neck, and a warty yellow skin. The cream-colored flesh has a fine texture.



**White Bush Squash** is a favorite summer variety of the squash family. It is often called "scalloped" or "pattypan."



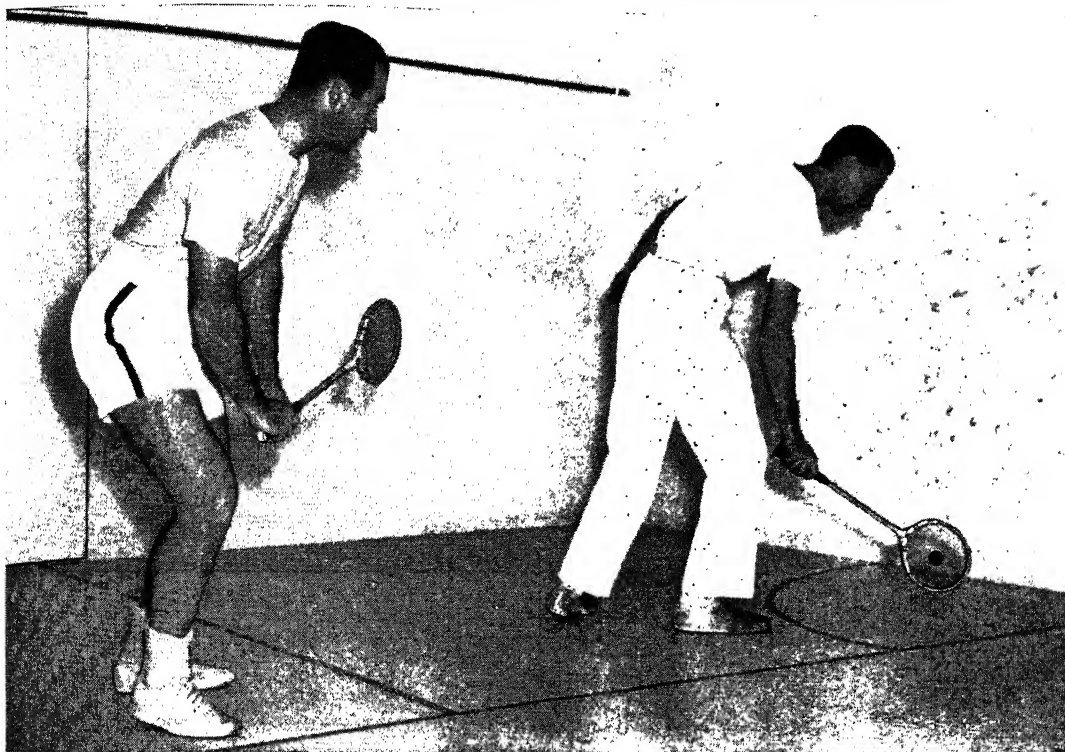
**Butternut Squash** has firm orange-colored flesh of very sweet flavor.



**Hubbard Squash** is probably the most popular of the winter varieties. It grows to a large size and has rich dry flesh. It keeps well in winter.

Photos: J. Hornee McFarland; U.S.D.A.





Union League Club

### Squash Player Making a Backhand Shot from Rear Court

After that nothing needs to be done but control the weeds.

Squashes are attacked by several insects. Squash bugs are hard to control. The adults, called stink bugs, are picked by hand and killed. Their egg masses are also gathered and destroyed. The squash-vine borer is a very destructive insect. No effective control of it is known.

Squashes, especially the yellow-fleshed winter kinds, are a good source of vitamin A. They also have a fair degree of energy value.

The history of squashes and pumpkins runs together. Both first came from tropical America. They were raised over most of the Atlantic Coast before the discovery of America. They were taken later to England and France, where the summer squashes are called *marrows*. The fall and winter types of squashes do not grow well in England.

L.A.S.

See also CHAYOTE; GOURD; PLANT (color plate, Vegetables Unknown to our Forefathers).

**Classification.** All three species of squash or pumpkin belong to the family *Cucurbitaceae*. Summer squashes are *Cucurbitapepo*; cheese pumpkins are *C. moschata*; and winter storage squashes are *C. maxima*.

**SQUASH RACQUETS**, commonly called SQUASH, is a court game for two or four players. It is an offshoot of the game of racquets, and was originated at the Harrow School in England about 1850. Squash was introduced into the United States from Canada in the 1880's. It soon became a favorite sport in private clubs. But the game has not been very popular generally because of the expense of erecting courts.

Squash is similar to handball except that small, tennislike rackets are used to hit the ball. The game is played on a court 32 feet long and 18 feet, 6 inches wide. The ball is played against a forward wall and two side walls, all 16 feet high. Doubles courts are slightly larger, with higher playing walls. Fifteen points constitute a game, and three games out of five wins the match.

As normally played, squash racquets is less active and exhausting than handball, because it has a smaller court and because greater reaching distance is afforded by the use of the racket.

E.D.M.

**SQUATTER.** Persons who have no deed or other evidence of title to land may claim ownership because they are actually living there. Such persons are called *squatters*. Their claim to land is usually valid against any other except the claim of a person who can prove legal title. As used in American history, the term often refers to persons who settle on land which belongs to the United States Government. Formerly, squatters on public lands, who lived there long enough, were permitted to establish their claims under the Homestead Law.

The word *squatter* was used in a special sense during the period of American history just before the War between the States, when it was used in connection with squatter, or popular, sovereignty.

J.D.H.

See also HOMESTEAD LAW; SQUATTER SOVEREIGNTY.

**SQUATTER SOVEREIGNTY**, or **POPULAR SOVEREIGNTY**, was the doctrine that the people of a territory could decide for themselves whether or not they wanted slavery, even before the territory was organized as a state. This theory developed during the controversy over slav-

ery that is part of the history of the early United States.

The North, as a whole, opposed the extension of slavery into any of the land acquired from Mexico after the War with Mexico. The South, even more unanimously, favored it. Many persons on both sides found the theory of squatter sovereignty a happy solution which relieved both the states and the Congress of a difficult problem. Lewis Cass probably originated the theory of squatter sovereignty, but Stephen A. Douglas was its most prominent advocate. Douglas renamed it *popular sovereignty*.

The Kansas-Nebraska Act of 1854 permitted the people of the Kansas and Nebraska territories to decide for or against slavery within their respective borders. The authors of the law took for granted that Nebraska would vote free, and Kansas, slave. But antislavery advocates sent many free-state settlers into Kansas, while many proslavery residents of Missouri crossed into Kansas, sometimes to settle, but often only to vote. The violence and bloodshed that resulted showed clearly that the principle of popular sovereignty would not work.

After the War between the States, when slavery was abolished, the principle of popular sovereignty lost its significance. J.D.H.

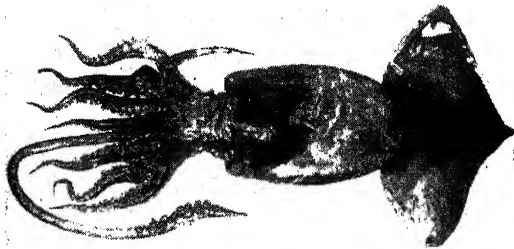
See also DOUGLAS, STEPHEN ARNOLD; KANSAS-NEBRASKA BILL.

**SQUETEAGUE**, *skwee TEEG*. See WEAKFISH.

**SQUIB**. See NEWSPAPER (Terms).

**SQUID**. Squids are marine mollusks related to the octopus, nautilus, and cuttlefish. They are found throughout the world and may vary in size from a few inches to nearly forty feet in length.

Squids have long spindle-shaped bodies with two fins at the tail end. They have ten arms, two of which are longer than the others. All the arms have rows of sucking discs which are used in seizing and holding the prey. The shell, or pen, is horny and inside their bodies. The



American Museum of Natural History

**Ten Arms of the Squid**, each equipped with rows of sucking discs. These are used to catch fish the sea animal eats.

head is large and has two well-developed eyes, a pair of powerful horny jaws, and a rasping tongue, or *radula*. A muscular tube, the funnel, is located beneath the head, and the squid swims by filling the mantle cavity with water and forcing it out through the funnel so that the animal is propelled backward. Squids have an "ink sac" from which they spurt a dark fluid or underwater "smoke screen" when fleeing from their enemies. They can also protect themselves by changing their color to blend somewhat with their background.

Squids are used for food by many peoples, especially the Chinese and Italians, and are used for bait by fisher-

men. They are a serious pest to the mackerel and herring fisheries for they devour large numbers of small fish.

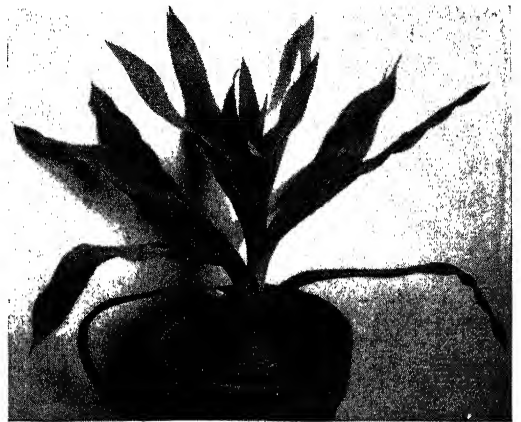
The *common squid* ranges from Nova Scotia to Florida. The *giant squids* are found off Newfoundland. W.J.C.

See also CUTTLEFISH; NAUTILUS; OCTOPUS.

**Classification**. Squid belong to the class *Cephalopoda* in the phylum *Mollusca*. The common squid, *Leoligo pealeii*, is in the family *Loliginidae*.

**SQUILL** is the name given to several plants which have bulbous roots. They belong to the lily family. One kind of squill, called the *sea onion*, grows around the Mediterranean Sea. It produces bulbs sometimes as heavy as four pounds. The bulbs have medicinal value.

The sea onion's bulbs are collected in August. The outer husk is removed, and the bulb is sliced and dried



U.S.D.A.

**The Big Bulblike Root of Squill Is Used in Medicine**

in the sun. The drug made from the bulbs is generally used in sirup form or in "tincture of squill." It stimulates the heart and is quite irritating. It particularly affects the stomach, intestines, and bronchial tracts. Squill is sometimes used as an expectorant and diuretic. It is also used to treat chronic bronchitis, but never when the disease is acute. Its use is decreasing because its irritating effects overbalance the good it might do. Red squill is used as a rat poison.

The name *squill* is also given to the genus *Stilla* in the lily family. It includes eighty or more species in the temperate regions of the Old World. H.N.M.

**Classification**. The sea onion belongs to the family *Liliaceae*. Its botanical name is *Urginea maritima*.

**SQUINCH**. See ARCHITECTURE (Terms).

**SQUINT** is an abnormal condition of the eyes in which one eye is fixed on one object and the other eye is fixed on another object. This condition is also known as *strabismus* and *cross eye*. Normally, the eyes are so located that both eyes see the same object at the same time and in the same place. In strabismus one eye turns away from its normal position. If this eye turns inward the condition is known as *convergent strabismus*, and if the eye turns outward the condition is known as *divergent strabismus*. If the crossed eye turns upward or downward, the condition is known as *supravergent strabismus*.

The cause of strabismus is not known, except in rare cases where the condition is due to an injury or fall. It is

known that the tendency to have strabismus is inherited. Strabismus can be corrected in children, especially if the treatment is started early. Treatment of strabismus usually consists of the use of glasses, forced development of the weaker eye, and training in the use of both eyes at the same time. Only 15 per cent of all cases require a surgical operation.

H.S.G.

See also CROSS-EYE.

**SQUIRE**, or **ESQUIRE**. See **KNIGHTS AND KNIGHTHOOD** (Training).

**SQUIRREL**. Squirrels are rodents, or gnawing animals. They live in both North America and the Old World. Squirrels are usually graceful, quick, and active. They have long tails and rather slender bodies.

There are a great many different kinds of squirrels. Some are tiny and only a few inches long. Others may be as large as cats. Some of them live on the ground, and others make their homes in trees. Some have long and beautiful ears. Still others are able to glide from tree to tree by means of flaps of skin along the sides of their bodies. Some squirrels' bodies are patterned with stripes and patches of varying colors. Some squirrels are black, others are reddish brown, and some are gray.

When most persons think of squirrels, they think of an animal that is thrifty and stores nuts in the summer to eat when the winter comes. But not all squirrels do this. Some of them become very hungry before spring.

#### Kinds of Squirrels

No one has ever made a complete count of the number of different kinds of squirrels. The squirrels that live in North America are quite different from their European cousins.

**Red Squirrels** are among the most common of all the American squirrels. They live in the northern United States, and in Canada as far north as trees grow. The red squirrel is a very active creature. Its body is not over eight inches long. The upper parts of the red squirrel are chestnut red. The lower parts are white. There is a black stripe along each side. The red squirrel has a tuft of hair on the tips of its ears.

Three or four young are born in a litter in the spring, and sometimes during other seasons of the year as well. This squirrel lives almost entirely in trees. It makes its home in a hollow tree trunk, and makes a nest of

**Proteins, Fats, and Carbohydrates**, all neatly packaged in a peanut shell, get a squirrel's undivided attention.



H. H. Pittman

**A Striped Ground Squirrel** examines the roots sticking out of the side of a bank, in search of the juicy, tender ones.

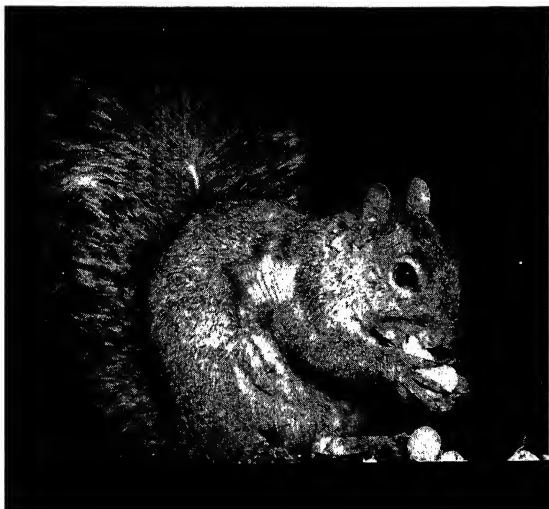
leaves and twigs. Nuts and grain are its favorite food. It also eats birds' eggs, young birds, insects, fruits, and tender twigs.

This squirrel is one of the noisiest of the squirrels, and chatters from its perch in the treetops. Red squirrels remain active throughout the year, except in the very coldest weather. They prefer to live in pine forests, and often pile up great stores of pine cones. Such a store may contain six or ten bushels of pine cones. Red squirrels are also able to swim across rivers and lakes, in case their food supply runs out.

The red squirrel is sometimes called the *chickaree*. This name is also given to a reddish squirrel that lives

**Fence, Branch, and Telephone Wire** are all highways to the lightning-quick and sure-footed little rodent.

Ewing Galloway; Rose, Black Star



in the western parts of the United States, and is sometimes called the pine squirrel.

**Gray Squirrel.** There are a great many different kinds of gray squirrels in the United States. One of the most common is found from New England west to Minnesota. The eastern gray squirrel is one of the largest of all squirrels. It is hunted both for its fur and for its meat. Two to four young are born in each nest in the spring. They are born naked and hairless, and are about the size of the last section of your little finger.

Like the red squirrel, the gray squirrel eats the young and eggs of birds. But it is not so dangerous an enemy of birds as is the red squirrel. The gray squirrel has an interesting way of escaping the notice of its enemies, such as the hawk. When an enemy comes in sight, the squirrel flattens out on the side of a horizontal branch of a tree. In this position, its gray-coated body is very hard to see. Gray squirrels, like red squirrels, are very talkative. Their barking can be heard for an eighth of a mile. Gray squirrels are quite common in city parks. They may become so tame that they climb on the shoulders of passers-by who stop to feed them.

**Fox Squirrels** are large and handsome. Some of them weigh as much as three pounds. Their colors vary. Some are jet black, others are reddish gray, and the colors of others vary between these shades. Some fox squirrels live in the Middle Western states. Others live in the Southern states. Fox squirrels are not quite as active and agile in their movements as are gray and red squirrels. Fox squirrels are generally considered good eating, and are often hunted. For this reason, laws have been made to protect them from being killed off.

**Other Kinds of Squirrels.** The common *flying squirrel* has a thin membrane on each side of its body from the front leg to the rear leg. It can glide from tree to tree by means of this membrane. The tassel-eared squirrels live in the western part of the United States. These squirrels have long ears, and look a little like rabbits. The two most important tassel-eared squirrels are the *kaibab* squirrel and the *aberti* squirrel. These squirrels are often handsomely striped along the sides, with a brown stripe along their backs, gray on the sides, and white on the bottom. Kaibabs do not store up nuts during the summer for winter eating. This behavior of the

Kaibab is contrary to the squirrel's reputation for thrift.

The *common squirrel* lives throughout Europe. It is colored somewhat like the American red squirrel, but is larger. Squirrels found in the tropics are noted for their brilliant coloring, as are those which live in the Orient.

The common ground squirrels of the United States have many names, such as striped ground squirrel or gopher. This animal has thirteen striped lines along its back. There are about ninety-seven distinct types of ground squirrels found among thirty-one species. S.P.Y.

See also CHINCHILLA; CHIPMUNK; FLYING SQUIRREL; GOPHER; MARMOT; PRAIRIE DOG.



Even As He Takes a Morsel from the hand of a friend, the squirrel keeps a bright and watchful eye on the photographer.

**Classification.** The squirrel family is known scientifically as *Sciuridae*. The red squirrel is *Sciurus hudsonicus*; the common gray squirrel is *S. carolinensis*; the fox squirrel that lives in the Middle Western states is *S. niger rufiventris*; and the southern fox squirrel is *S. niger*. The abert squirrel is *S. aberti*, and the kaibab squirrel is *S. kaibabensis*.

**SQUIRREL CORN.** See DICENTRA.

**SQUIRRELFISH.** See FISH (color plate, Tropical Salt-Water Fishes).

**SQUIRREL HAKE.** See HAKE.

**SQUIRRELTAIL GRASS.** See WILD BARLEY.

**SRINAGAR.** See INDIA (Cities).

**STABILIZER.** See AERODYNAMICS (Stability in Flight); AIRPLANE (Parts of an Airplane); GYROSCOPE (Uses of the Gyroscope).

**STABLE EQUILIBRIUM.** See GRAVITY, CENTER OF.

**STABLE FLY.** See FLY (Body of the Housefly).

**STADACONA, stah-DAHK oh nah,** an Indian town where the city of

Quebec now stands. See QUEBEC (History).

**STADHOLDER.** See NETHERLANDS, THE (History).

**STADIUM, STA dih um.** A large uncovered structure built around an open field is called a stadium.

One of the first stadiums was the foot-race course at Olympia in ancient Greece. Other famous stadiums were at Delphi, Athens, and Epidaurus in Greece and at Ephesus in Asia Minor. The stadiums were usually enclosed by terraces shaped like horseshoes to give the spectators a clear view of the field. Seats were often built on the terraces. The famous stadium at Athens has been rebuilt. It was the scene of the Olympic Games in 1896.

The modern stadium has seats arranged in rows, or tiers, from which spectators view football and baseball games, track meets, boxing matches, and other public events. Universities have built many stadiums for ath-

letic games. The stadiums are often paid for by students and alumni as memorials to those who gave their lives in the country's wars. Other stadiums are built by cities, and are used for civic events as well as for sports. The magnificent Soldier Field on the lake front in Chicago is an example of a municipal stadium.

Stadiums have been built in European cities which have been hosts at Olympic Games. These include stadiums at Athens, Paris, London, Stockholm, and Antwerp.

The following table gives the names and seating capacities of the twenty-five largest stadiums in the United States:

NAME AND LOCATION OF STADIUMS	SEATING CAPACITY
Philadelphia Municipal Stadium, Philadelphia	130,000
Soldier Field Municipal Stadium, Chicago	125,000
Los Angeles Coliseum, Los Angeles, Calif.	105,000
Stanford University Stadium, Palo Alto, Calif.	90,000
Rose Bowl, Pasadena, Calif.	89,000
U. of Michigan Stadium, Ann Arbor, Mich.	87,000
Municipal Stadium, Cleveland, Ohio	80,000
California U. Memorial Stadium, Berkeley, Calif.	79,000
Franklin Field, U. of Pennsylvania, Philadelphia, Pa.	78,000
Ohio Stadium, Ohio State U., Columbus, Ohio	75,000
Yankee Stadium, New York, N.Y.	74,000
Tulane U. Stadium, New Orleans, La.	72,000
Yale Bowl, Yale U., New Haven, Conn.	70,000
Memorial Stadium, U. of Illinois, Urbana, Ill.	70,000
Pittsburgh U. Stadium, Pittsburgh, Pa.	67,000
Buffalo Civic System, Buffalo, N.Y.	65,000
Baltimore Stadium, Baltimore, Md.	64,000
Polo Grounds, New York, N.Y.	61,000
Kezar Stadium, San Francisco, Calif.	60,000
U. of Minnesota Stadium, Minneapolis, Minn.	58,000
Harvard U. Stadium, Cambridge, Mass.	57,000
Cartier Field, Notre Dame U., Notre Dame, Ind.	55,000
Briggs Stadium, Detroit, Mich.	54,000
Comiskey Park, Chicago, Ill.	50,000
Princeton Stadium, Princeton, N.J.	50,000

The stadium was also a measure of distance among the Greeks, and later, the Romans. It was the distance between the end pillars of the stadium at Olympia, and was about 630 feet in English measurement. E.D.M.

See also **COLOSSEUM**; **HIPPODROME**.

**STAËL, STAH el, MADAME DE** (1766-1817), was a French writer. Her full name was Anne Louise Germaine Necker de Staël-Holstein. She wrote many books, but she is more noted for the influence she had on the work of other writers of her time than for her own writings. Madame de Staël was the first person to write about the German romantic movement, and her writings led to a similar movement in France. She brought France away from strict classical literature and introduced instead a liberal, worldly literature.



Brown Bros.  
**Madame de Staël helped introduce Romanticism into French literature.**

Madame de Staël was born in Paris, the daughter of the French finance minister, Jacques Necker. (See **NECKER, JACQUES**.) She was an unusually bright child and took a great interest in world affairs. In 1786, she married the Swedish minister to France, Baron de Staël-Holstein, at the request of her parents. The baron was much older than she was and the marriage soon ended in a friendly separation. Two years after her marriage she published her *Letters on Jean Jacques Rousseau*, which expressed her approval of the early events of the French Revolution. Later she broke with the revolutionists and spent many years in exile. During this time she visited Germany and met the great literary men of the day. L.J.

See also **ROMANTICISM**.

**Her Works** include *Corinne*; *On Germany*; and *Thoughts on the French Revolution*.

**STAFF.** See **MUSIC** (Language of Music).

**STAFF** is an inexpensive material resembling plaster. It is used as an exterior and interior finish for temporary structures, such as exposition buildings and statuary. It is made chiefly of plaster of Paris and hydraulic cement, mixed in water with dextrine and glycerin. Staff is put on like plaster. See also **PLASTER**. W.C.H.

**STAFF, GENERAL.** See **GENERAL STAFF**.

**STAFFA, ISLAND OF.** See **FINGAL'S CAVE**.

**STAFF OF LIFE.** See **BREAD**.

**STAFFORDSHIRE.** See **DOG** (color plate, Terriers).

**STAG.** See **DEER**.

**STAG BEETLE** is the name of a family of beetles in which certain of the males have oddly enlarged jaws. These jaws look somewhat like the horns of a male deer and have given the beetle its name. In some cases, these "horns" are nearly as long as the body of the insect. Common American species include the *giant stag beetle* of the Southern States. It has jaws, or mandibles, an inch long and a body one and one half or two inches long. The *pinching bug* of the Eastern states is a stag beetle that flies by night. The adult stag beetles live in trees and feed on sap and on honeydew. The eggs are laid in cracks in the bark. They hatch into soft, white worms called larvae. See also **INSECT** (color plate, Beetles). G.P.

**Classification.** The stag beetle family is *Lucanidae*; order *Coleoptera*.

**STAGBUSH.** See **BLACK HAW**.

**STAGE.** See **THEATER** and the list of books at the end of the article.

**STAGECOACH.** The stagecoach was a horse-drawn coach which used to carry passengers and mail on a regular route. Sometimes it also carried freight. The first long stage line was established about 1670 between London, England, and Edinburgh, Scotland, a distance of 392 miles. At first, stagecoaches traveled only in summer. They were in constant danger from robbers. Floods, poor roads, and uncomfortable coaches which often broke down along the way made time schedules very unreliable.

In colonial America, stagecoach lines were first established about 1756. They operated chiefly between Boston, New York, and Philadelphia. In 1785, Congress began mail service by stagecoach. Greater comforts were added to the coaches, such as springs and





**Stagecoaches Carried Passengers and Mail** in colonial and pioneer days in the United States. The "stages" did not travel at night, and there were frequent delays when rain turned the

roads into seas of slippery mud. Even in good weather, the swaying and jolting of the stagecoach over the bumpy dirt roads was an ordeal not soon forgotten.

National Life Insurance Co.

cushions. Many of the finest stagecoaches of colonial and pioneer days were made at Concord, N.H. Many inns sprang up along the stagecoach runs. Early in the 1800's, travelers from Philadelphia, Baltimore, and Washington traveled to Ohio by the National Road. In elaborate Concord coaches drawn by six horses, they bounced along at a brisk ten miles per hour, taking two and one half days for the journey. Horses were changed at relay stations every fifteen or twenty miles. Later, stagecoach lines were operated in the West. But the railroads gradually took over the work of stagecoach lines, except in remote and mountainous regions. F.M.R.

**STAGE LIGHTING.** See **THEATER** and the list of books at the end of the article.

**STAGE SCENERY, or STAGE SETTINGS.** See **MOTION PICTURE** (Technical Staff); **THEATER** and the list of books at the end of the article.

**STAGHOUND.** A staghound is a large white hound with black and tan markings. It is bred in various parts of Europe, and is probably descended from the bloodhound. Its head looks somewhat like that of a pointer. But the staghound's neck is heavier, and its ears hang lower. Stagounds are used for hunting red deer. The staghound is not recognized as a distinct breed, and is found only in Europe. Even there the foxhound is taking its place.

S.E.M., Jr.

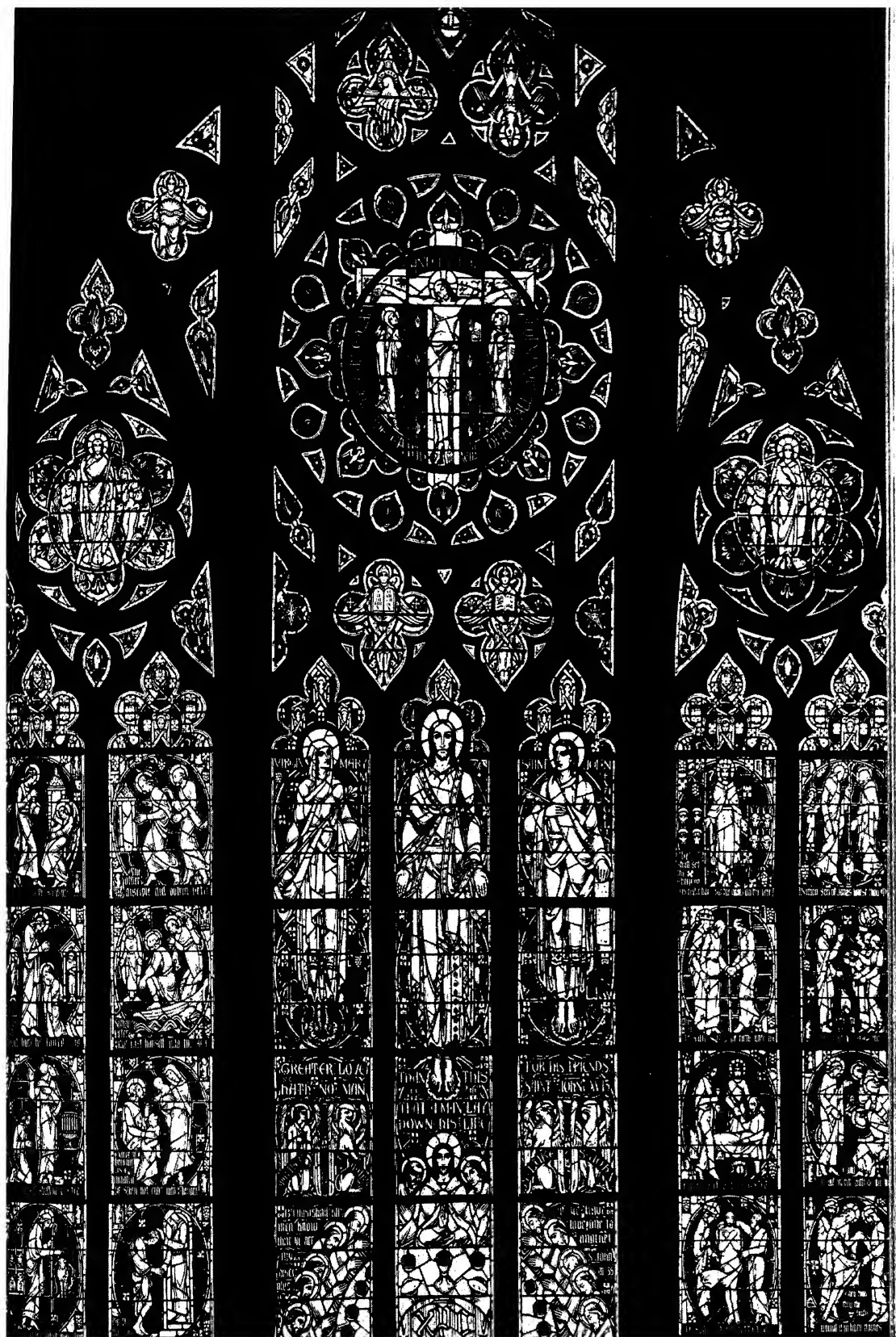
**STAIN** is a special type of dye that is used to bring out the grain in wood. Stains are named according to

the type of solvent that is used to dissolve the dye. Water, oil, and alcohol are the chief solvents of stain. Alcohol is considered the best solvent for wood stain because it does not cause the grain to rise above the surface of the wood, as water does. Oil penetrates the wood deeply and produces a lustrous finish, but it tends to smear, or bleed, into coats of varnish that may be applied over it.

G.L.Bu.

**STAINED GLASS** is glass colored by a chemical process. By far the most important use of stained glass has been for making stained-glass windows. This fascinating Christian art has had a curiously romantic history. The Byzantine historian, Procopius, praised colored windows in the A.D. 500's, but the earliest authentic examples now in existence date from twelfth-century France. Among them are superb creations that mark a mastery of active light and pure color, controlled by lead lines and painted patterns in a manner that is both artistic and scientific.

In France of the 1100's and 1200's, artists were designers, and pure colors were recognized as symbols of spiritual qualities. For example, red was the symbol of love, valor, and martyrdom. Blue represented wisdom, loyalty, truth, and Heaven itself. Yellow (or gold) stood for goodness and spiritual achievement, and so on through the whole range of pure color. So naturally enough the windows of that period are designed symbols—not pictures. They still vibrate sensitively to light



and function as architectural units. They keep out rough weather and let in glorified light.

A child's quick perception has given us a label for them that still distinguishes great windows. A seven-year-old boy once went with his father on his first visit to Notre Dame Cathedral in Paris. The great organ burst into music as his eyes caught the north rose window and he exclaimed, "It sings,—the window is singing!"

That boy was Viollet le Duc who later was to reveal, in a comprehensive essay, the inner secrets of that "singing." His monumental *Dictionnaire*, which was published at a time (1854-1868) when the art of stained glass was a lost art, greatly encouraged the revival of that art in the United States and in England early in the 1900's.

Artists and craftsmen gradually forgot the architectural function of a window—to admit light. From the 1500's onward they made pictures in glass that served like permanent curtains, to screen the light and to silence its eloquent vibrations.

The stained-glass craft reached its lowest level through the big business known as the "Art Glass Industry" which filled countless American churches and public buildings with the worst windows in the world.

Dull expressions of ugliness and cheap prettiness in high places have always had their own way of challenging and stimulating the taste of sensitive spirits. So it is that through the tireless efforts of talented and eager-minded lovers of significant beauty in architecture and its allied arts, the original craft of stained glass has again been developed in America and Europe during the past fifty years as a creative art.

See also BOSTON (Arts and Crafts).

**STAINLESS STEEL** is a name given to any one of several kinds of alloy steel which resist rust and corrosion. Chromium is the chief metal used with iron and carbon in stainless steel. Nickel and manganese are also occasionally used. The most familiar use of stainless steel is in household cutlery but it has wide uses in various industries. Railway passenger cars and locomotives are sometimes made of stainless steel. G.L.BU.

**STAINS, REMOVAL OF.** See DRY CLEANING; FAT.

**STAKED PLAIN.** See NEW MEXICO (Location, Size, and Surface Features).

**STAKE DRIVER.** See BITTERN.

**STALACTITE**, *stah LAK tite*. The beautiful stone formations that hang down from the walls and roofs of some caves are called stalactites. Most stalactites look somewhat like icicles. They usually form in limestone caves. They are caused when water drips through cracks in the roof of the cave and carries the mineral called calcium carbonate, or calcite, with it. As the water evaporates, it leaves formations of the calcite hanging. Stalactites of basalt rock hang from the roofs of some

lava caverns. Similar formations of ice are found in the ice caves of arctic regions.

Formations which are built up from the floor of a cave are called stalagmites (see STALAGMITE). In the United States, there are excellent examples of stalactites and stalagmites in Carlsbad Caverns National Park in New Mexico, in the Luray Caverns of Virginia, in Mammoth Cave in Kentucky, and in Wyandotte Cave in southern Indiana.

E.D.W.

See also CALCITE; CAVE.

**STALAGMITE**, *stah LAG mite*. Stalagmites are stone formations which rise up from the floors of caves, especially in limestone caverns. They are formed when the water dripping from the walls and roofs of the cave carries with it deposits of calcium carbonate, or calcite. As the water evaporates, the calcite is built up into beautiful formations which look like icicles upside down. Similar formations which hang



Luray Caverns Corp.

**Stalactites Hanging from the Roof of Luray Caverns** in Virginia's Shenandoah Valley limestone belt. This tomblike room is called "The Cathedral" because of the beautifully colored rock formations, which look like a pipe organ.

down from the roof are called stalactites. (See STALACTITE.) Sometimes stalagmites and stalactites join together to form columns or stone curtains against the walls of the cave. See also CALCITE; CAVE.

E.D.W.

**STALIN, STAH leen, JOSEPH** (1879- ), is Generalissimo and Prime Minister of the Soviet Union. He rose from very humble beginnings to become dictator of more than one sixth of the earth. In his youth Stalin was a revolutionary in the Russian underground. He advanced in the Communist party through his shrewd and ruthless methods until he took over both the party and the Soviet government. As Nikolai Lenin's successor, he organized Five-Year plans to industrialize and socialize his country. His fame reached its greatest heights during World War II, when he led the Soviet Union's armies and people in their resistance to the Nazi attack. With President Franklin D. Roosevelt's death in April, 1945, and Prime Minister Winston

Churchill's defeat in the British elections in July, 1945, Generalissimo Stalin was the only one of the "Big Three" of the United Nations to be alive and in power when final victory over the Axis countries was won.

**The Young Revolutionary.** In the country which Stalin came to rule most people are Russians or other Slavs, but Stalin is neither a Russian nor any other kind of Slav. He was born in Georgia, a province in southern Russia, and is a member of one of the more than 170 national minorities living in the Soviet Union. He was born Iosif Vissarionovich Dzhugashvili, the son of a shoemaker in the small Transcaucasian town of Gori. His father drank heavily and died when the boy was eleven. The boy's mother was a devout Christian and wanted her son to study for the priesthood. At fifteen Stalin was graduated from a parochial school, and moved from Gori to Tiflis (now called Tbilisi), capital of Georgia and the largest city in Transcaucasia. There he entered a theological seminary to study to become a priest. His mother made a living for both of them as a seamstress, and injured her eyesight in this work. In her struggle against poverty, she also did washings and baked for wealthy people.

At the age of nineteen, while still a student, Stalin joined the Russian Social-Democratic party and broke with religion. The next year, in 1899, he was expelled from the seminary shortly before he was to be graduated. Late that year he found himself a clerk's job in the Tiflis Geophysical Observatory, and in the meantime carried on his secret work as a revolutionary against the czar's government. In May, 1901, he helped to organize a street demonstration of two thousand workers, which the police broke up with bloodshed and arrests. Stalin fled first to Gori, and then to Batum on the Black Sea, where he was arrested in April, 1902. He was tried in July, 1903, and was sentenced to three years' exile in Siberia. Four times between the years 1904 and 1917 he escaped from exile, only to be recaptured and imprisoned again.

**Joins the Bolsheviks.** When the Russian Social-Democratic party split into two factions in 1903, Stalin followed Lenin, who headed the Bolshevik faction. This was the aggressive or militant majority of the party, which opposed the Mensheviks, or the moderate minority. Between his escapes, Stalin worked as a professional revolutionary under various names in Batum, Baku,

Tiflis, and Saint Petersburg (now Leningrad). In December, 1905, Stalin attended a Bolshevik conference in Finland as a delegate from the Caucasus, and met Lenin for the first time. In the summer of 1907, after a secret conference with Lenin in Berlin, Stalin traveled to Tiflis to help organize an armed holdup of a vehicle carrying a bag of money for the czar's treasury under a Cossack escort. The revolutionaries' bombs and revolver shots killed three of the guards and wounded some fifty others. The money, which amounted to 341,000 rubles, or about \$170,000, was taken away to fill the Bolsheviks' treasury.

In 1912 Stalin became a member of the Central Committee of the Bolshevik faction. The same year, after his fourth escape from Siberian exile, he went to Krakow in Austrian Poland and to Vienna to see Lenin and other Russian revolutionaries. Late that year and early in 1913 he wrote under Lenin's direction an important pamphlet on the problem of national minorities. By that time he had selected as his revolutionary name "Stalin," which means "Man of Steel." He had been married in 1904, but his wife died in 1907 and left him with a two-year-old son.

#### **Bolshevik Revolution.**

The fall of the czar in March, 1917, found Stalin in exile in a far-off corner of Siberia. The revolution freed him, and he journeyed to Saint Petersburg (then known as Petrograd). He arrived three weeks before Lenin returned from his

exile in Switzerland. Stalin worked closely with Lenin through the Bolshevik preparations to seize power. In July, 1917, after the first and unsuccessful attempt of the Bolsheviks to overthrow the moderate government of Aleksandr Kerensky, it was Stalin who saved Lenin from arrest and perhaps death. After the Bolshevik triumph in November, 1917, Stalin became Commissar of Nationalities in Lenin's new Soviet government. Stalin's role was at first far less spectacular than that played in the cabinet by Leon Trotsky, the man he was soon to rival.

A civil war between the Reds or Bolsheviks (since March, 1918, called Communists) and the Whites, who were mainly monarchists, followed the Bolshevik Revolution. In the war Stalin helped to gather food supplies for the Red side, but before long he also assumed military duties, especially at Tsaritsyn (now Stalingrad) on the Volga. In spite of Stalin's ability, Trotsky, who was



U.S. Signal Corps

**Joseph Stalin at the Yalta Conference** during World War II. As Generalissimo of the Soviet forces, he discussed military strategy with other important Allied leaders. He wears the highly prized Order of Lenin on his left breast.

then the war lord of Soviet Russia, deeply resented his interference. That period in 1918 and 1919 marked the beginning of the sharp hatred and competition between the two leaders.

The Communists won the civil war, but Lenin was seriously ill. In 1922 Lenin wanted to take strong measures to end the increasing strife among his followers, and appointed Stalin to the post of secretary-general of the Communist party. There is evidence that Lenin soon regretted his choice, for Stalin used this key position to build a political machine for himself at the expense of other leaders. But Lenin was too ill to interfere, and his death in January, 1924, came too soon for Stalin to lose his job.

**Removes Trotsky.** As a supporter of the so-called Right opposition within the party, Stalin most cleverly moved against Trotsky. Trotsky depended on his talents as a brilliant orator, and made fun of the dull speeches of plodding Stalin, but Stalin with crafty patience removed one after another of Trotsky's supporters from important posts in the party and the government, and appointed instead his own men and women. With their help, in November, 1927, Stalin expelled Trotsky from the Communist party. Early in 1929 he banished Trotsky from the Soviet Union. In August, 1940, after many wanderings, Trotsky was assassinated in Mexico City. Many persons believe that the assassin, a little-known Belgian, had been selected and trained by Stalin's secret police.

**First Five-Year Plan.** Already in the late 1920's, while he was discrediting Trotsky, Stalin had begun maneuvers against Nikolai Bukharin and other Right oppositionists. He discarded their program of moderation, and punished them personally with expulsions or suspensions from the party. In 1928 Stalin introduced the First Five-Year Plan, a radical measure of industrialization and collectivization such as Trotsky had earlier advocated. But Trotsky favored promoting a world revolution at the same time as socialization was carried out in the Soviet Union. For Trotsky did not believe that socialism could succeed in one country, surrounded by a world of private capitalism. Stalin, on the other hand, was willing to sacrifice some aspects or prospects of a world revolution while he proved to humanity that "socialism in one country" was possible. Some critics assert that in their political theories Stalin and Trotsky were not too far apart. They say that their fight was really a personal one for power. Such critics say that if Trotsky had won, he would have followed the same policy of building a police state under the misleading name of "socialism" as Stalin did and at the same high price as Stalin made the Soviet Union pay.

The price that the Soviet people had to pay for Stalin's "socialism" proved to be indeed bloody and high. The collectivization of Russia's villages had met with resistance from the farmers, and millions of peasants and their families were uprooted by Stalin's police and exiled to Siberia. Many villagers were labelled *kulaki*, or exploiters, and were executed. Few *kulaki* survived starvation at home or hard labor in exile in Siberia. But Stalin achieved his desired result. Within a few years the remaining peasants joined the new collective farms, and agriculture in Russia was modernized

and made efficient through the use of farm machinery.

As new cities and giant factories rose in the campaign of industrialization, workers suffered hardships, and managers and engineers were "purged" on charges of sabotage and wrecking. Stalin later declared that many of these were innocent victims after all, and purged some of the purgers, including two chiefs of his secret police. There was a popular rumor that those who were supposed to have protested in vain against these acts included Stalin's second wife. He had married her shortly after the revolution in 1917. She died mysteriously in November, 1932, and left Stalin with two young children, a boy and a girl.

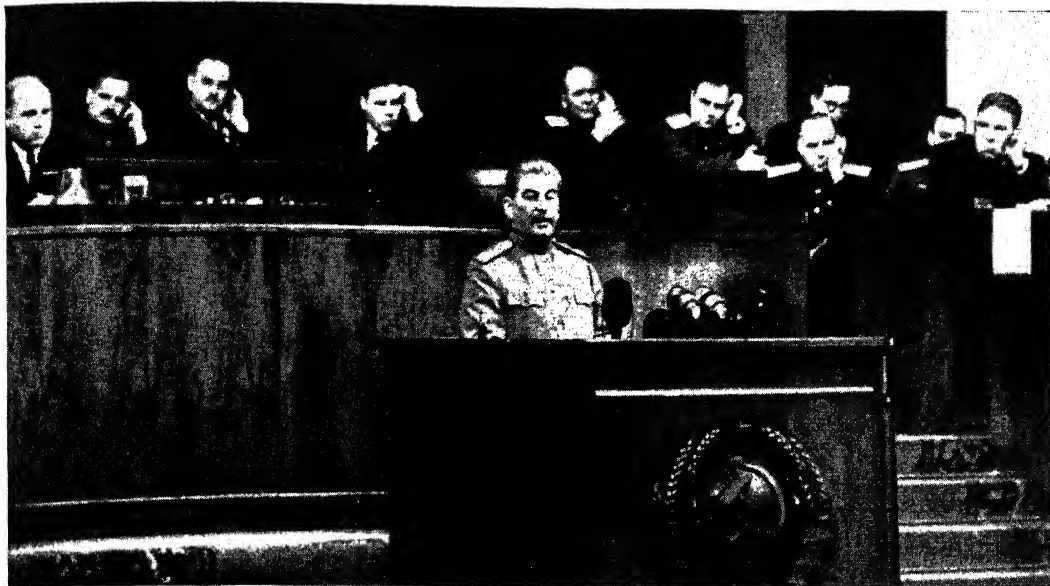
**Purges Enemies.** The most sweeping purges were carried out in the 1930's in the Communist party itself. A very high percentage of Communists lost not only their party membership but also their lives. The so-called "Moscow Trials" of 1936 to 1938 sent to their death Bukharin, Lev Kamenev, Grigori Zinoviev and other "Founding Fathers" of the Soviet republic. Stalin accused them of plotting with foreign powers to bring about the downfall of the Soviet Union. Similar executions on similar charges took place in the highest ranks of the Red army and navy. Despite the "confessions" of some of these men, history has yet to prove their guilt. Actually, a number of these and lesser men did not confess before they died, either through suicide when threatened by purge, or by being shot after secret trials or no trial at all.

In the Five-Year plans many young people were moved by genuine enthusiasm to bear untold hardships of their own free will, and so in the purges Stalin's explanations were readily accepted by many with complete trust. Young people who were given jobs and comforts which used to belong to the purged leaders, believed that these leaders had indeed been spies and wreckers, whom the wise Stalin fortunately caught at their crimes. The partial failures of the Five-Year plans were explained away by the ill will charged to the purged leaders, managers, and engineers.

After the purges, Stalin ordered the history of the revolution entirely rewritten. Most of the old leaders who knew Stalin from the early days of the Revolution were either removed or frightened into silence, and the new generation believed that Stalin was indeed Lenin's only chosen successor. A kind of religious worship of Stalin was rapidly built up throughout the country. Cities were renamed in his honor. The new constitution of 1936 was called the Stalin Constitution. Prizes given by the state to scientists, writers, and artists bore his name. Portraits and statues of Stalin appeared everywhere in great numbers, and they made Stalin appear much better looking than he actually was. As against the real Stalin with his short stature, his dark pock-marked face, and his slightly misshapen left arm, the portraits and statues showed him taller than reality and free of any physical deformities or of the grayness that in later years marked his thick black hair.

**World War II.** World War II undoubtedly hastened these marks of age. During the war Stalin carried the heavy burden of his country's topmost leadership with considerable grit and skill. But his critics charge that he had helped to start the war by his pact with Adolf





Joseph Stalin Addressing a Meeting of the Moscow Soviet

Hitler in September, 1939, and that by that pact he really meant to avoid war for the Soviet Union altogether rather than gain time for better defense, as supporters of Stalin later claimed. There is, in fact, some proof that Stalin was much surprised when Hitler broke the pact by invading the Soviet Union in June, 1941, and interrupted the peaceful labors of the Third Five-Year Plan.

On May 6, 1941, Stalin took over from Vyacheslav Molotov the chairmanship of the Council of People's Commissars. This position was renamed the Premiership of the Council of Ministers in March, 1946. In July, 1941, Stalin took over from Marshal Semën Timoshenko the Commissariat of Defense, or Ministry for the Armed Forces, and held it until 1947. At the same time Stalin appointed himself supreme commander in chief of the armed forces of the Soviet Union. On March 6, 1943, Stalin named himself marshal. On June 27, 1945, he became generalissimo. But the most important position remained his unofficial chairmanship of the Politburo, the highest policy-making and governing organ of the Communist party and thus of the Soviet Union. This office gave Stalin even greater power than his position as secretary-general of the party, which he used in his rise to power with such complete skill and which he continued to hold along with his other official positions.

A.PARR.

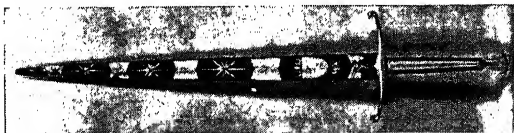
See also **BOISHEVIST**; **TROTSKY, LEON**; **UNION OF SOVIET SOCIALIST REPUBLICS**.

**His Works** include *Problems of Leninism, Marxism and the National and Colonial Question*, and *On the Great Patriotic War of the Soviet Union*, a collection of Stalin's articles, speeches, and interviews of the period of World War II.

**STALINABAD**, *stah lee nah BAHD* (population 82,540), is the capital of the Tadzhik Soviet Socialist Republic of the Soviet Union. It was formerly called Dushambe.

**STALINGRAD**, *stah leen GRAHD* (population 445,476), is one of the most important manufacturing cities of the Soviet Union. It lies on the west bank of the Volga River, about 250 miles above the river's mouth. Stalingrad's factories make tractors and other heavy machinery and munitions. The city is also an important educational center.

Stalingrad was founded in the 1200's. Its name was originally Tsaritsyn, but it was renamed in 1925 in honor of the Soviet leader Joseph Stalin. During World War II, the city was one of the deep points of the Ger-



British Information Service

**Stalingrad's Sword of Honor** was a gift from King George VI of England. It was presented to Joseph Stalin at the Tehran Conference in 1944, as a tribute to the gallant defenders who halted the German invaders in World War II. On the blade is written "To the steelhearted citizens of Stalingrad — The gift of King George VI — In token of the homage of the British people."

man drive into the Soviet Union. Soviet armed forces heroically defended the city and finally captured a large German army after a long and bloody battle. W.H.CHA.

**STALINO**, *stah leen O* (population, about 462,000), is the largest city in the Donets River basin. It lies in the southeastern part of the Ukrainian Soviet Socialist Republic, about eighty miles northwest of Rostov. Stalino is in the center of the rich coal fields of the Donets region. The coal that is mined near by operates the huge iron and steel mills that make Stalino one of the most important industrial cities in the Soviet Union. Machinery and food products are also manufactured in the city. Stalino was badly damaged during World War II when the Germans occupied it.

W.H.CHA.

**STALLINGS, LAURENCE** (1894- ). See GEORGIA (Arts and Crafts).

**STALWARTS.** See GARFIELD, JAMES ABRAM (Political Career).

**STAMBOUL.** See ISTANBUL (Location and Description).

**STAMBULISKI, ALEXANDER** (1879-1923). See BULGARIA (World War I and the Postwar Period).

**STAMEN.** See FLOWER (Stamens; illustration, Parts of a Flower).

**STAMFORD, Conn.** (population 47,938), lies in southwestern Connecticut near Long Island Sound. It may be considered a residential suburb of New York City since about 1,500 persons who live in Stamford travel the thirty miles to and from work every day. Stamford has its own industries among which are the making of locks, electric razors, boats, toys, druggist's supplies, and clothing. Recreation centers in the city attract swimmers and yachtsmen. Stamford was settled in 1641. It became a borough in 1830 and a city in 1893. G.E.F.

**STAMFORD BRIDGE, BATTLE OF.** See HAROLD, OR HARALD (III).

**STAMMERING AND STUTTERING** are two terms used to describe defective or disordered speech. The terms are often used interchangeably, but such a use is incorrect. Stammering is a continuous *block* defect in speech. It results in sudden inability to utter any sound. Stuttering is the repetition of sounds or syllables. The term stammering is being dropped, and stuttering is now used to mean both types of speech defect.

An example of stuttering is the inability to say clearly such words as *don't* or *animal*. The stutterer says *d-d-d-don't* and *a-a-a-animal*. Words and syllables are sometimes mispronounced during a period of stuttering. A sentence might then sound something like this. "Ma-ma-ma-mother, m-m-m-may Bob-bob-Bobby have a d-d-d-doughnut?"

In stuttering, there is a spasm of the speech muscles, which stops talking, sometimes almost entirely. Sometimes the difficulty in speaking then results in grimacing and other facial contortions which are caused by contractions of the speech muscles.

No one knows the specific causes of stuttering. There are about fifteen different theories as to what causes it and many methods are used to correct it. Shyness and lack of self-confidence often accompany it, but they are not believed to cause it. About four to six times more men than women are afflicted by stuttering. It is a speech problem which is very serious and should be given only expert attention. It is most common in very young children. If stuttering is not overcome, it may seriously handicap a person in his own development and in his relations with other persons. Stuttering can become so serious a handicap as to make a vocational failure of even a talented person. It is not associated with any lack of mental ability. Rather, as a group, stutterers have been found to have average intelligence.

Children often begin to stutter when they try to speak too rapidly, or if they are upset and excited. The condition is made worse if the speaker is aware of his defective speech. He strains to talk more distinctly, and the effort tightens the muscles of expression in his face and throat. This makes his speech worse. He may

become panicky at his plight, and thus increase the stuttering. He will stop only when he forces himself to relax and start over.

There are different ways in which many stutterers can use the voice easily, without stuttering. These include reading in unison, singing, speaking to groups before whom they have self-confidence, and speaking to themselves when they are alone. In general, public speaking is very difficult for them. They are attacked by self-distrust, panic, fear of their own stuttering, and embarrassment.

Treatment of speech disorders such as stuttering is a matter of training the mental processes and emotions, as well as retraining the speech of the individual. Each case must be treated individually, according to the needs of the person. Stuttering in very young children is sometimes outgrown. It is advisable not to call attention to children's stuttering and to exercise calmness and patience when they speak, in order to help them establish smoothness of speech by themselves. V.A.A.

See also LISPING.

**STAMP.** Stamps are official marks or seals. They are in the form of small printed pieces of paper with one glued surface. Many documents are not legal until they carry a government stamp. For example, the government may require the payment of a one-dollar tax on a real estate deed. A revenue stamp of one dollar in value is pasted on the face of the deed, as proof that the tax has been paid.

Stamp taxes were first levied by the Dutch in 1624. In 1694, the English used the stamp plan to raise money for carrying on a war with France. The British Stamp Act of 1765 was one of the direct causes of the American colonial revolt against Great Britain.

In 1814, stamp taxes became a part of the fiscal system of the United States. In 1862, the American Congress passed an important stamp law. The law required that government stamps be used on legal papers and on certain kinds of packages. The purpose of the law was to raise funds to pay some of the expenses of the War between the States. The law was repealed when revenue was no longer needed to pay war expenses. New stamp laws were passed during the Spanish-American War and World War I, to raise money to pay the costs of war.

Government stamps for raising money are known as internal revenue stamps. These stamps are required on such luxuries as tobacco and liquor. Many other items require internal revenue stamps. These include oleomargarine, snuff, and opium. Some states of the Union raise money by taxing cigarettes or other luxuries, and require that tax stamps be placed on the packages.

During World War II, the United States Government offered war savings stamps for sale to citizens. These stamps raised funds for the war, and also gave purchasers a fair return through interest. The ration stamp was another kind of stamp that came into use during World War II. The purpose of the ration stamp was to divide food and clothing equally among civilians.

People throughout the world are probably most familiar with the postage stamp. P.S.W.-JR.

See also BESSEMER, HENRY, SIR; INTERNAL REVENUE; AGE AND POSTAGE STAMP; STAMP ACT.



Brown Bros.

**Demonstration against the Stamp Act** in New York City, during the year 1765. The patriot carrying the sign is being cheered on by other colonists. A well-dressed Tory at the right looks with contempt at the anti-British display.

**STAMP ACT.** The British Parliament passed the Stamp Act in March, 1765. Its purpose was partly to provide funds for home expenses and partly to make the colonies self-supporting. The act provided that Americans must buy stamps for deeds, mortgages, liquor licenses, law licenses, playing cards, and almanacs. Even newspaper owners and publishers were forced to purchase stamps for their publications.

The Stamp Act was unpopular throughout the colonies. Patriotic societies organized to protest the sale of stamps. In cities and towns the slogan became "no taxation without representation." Crowds rioted against officers who tried to force people to buy stamps. Mobs attacked the homes of many British officials. Americans organized boycotts against British goods.



**These Three Stamps** were used by the British Government under the Stamp Act imposed upon the American colonies.

The Virginia Assembly called the act "illegal, unconstitutional, and unjust," and passed resolutions against taxation by the British Parliament. The Massachusetts House of Representatives invited all colonies to send delegates to a general congress. Seven colonies accepted the invitation. This Stamp Act Congress was the first colonial congress in America.

The Stamp Act Congress met in New York in October, 1765. It declared that no taxes could be collected without the people's consent. American resistance forced the British Parliament to repeal the Stamp Act in 1766. But Great Britain still insisted that it had the right to tax American colonists.

J.R.A.

See also ADAMS, JOHN (*The Fight Against the Stamp Act*); *REVOLUTIONARY WAR IN AMERICA* (Immediate Causes of the War).

**STAMP COLLECTING** is one of the most popular collecting hobbies in the world. Young persons, old persons, rich persons, and poor persons in every country collect stamps. Stamp collecting has been called "the hobby of kings and the king of hobbies." King George V of England, Franklin D. Roosevelt, and many other famous persons have collected stamps. Students of stamps are called *philatelists*. The name comes from two Greek words, *philos*, meaning *love*, and *atelos*, meaning *free of tax*, or *paid*. Stamps are signs that the postage, or tax, has been paid.

**Origins.** Great Britain issued the first stamps to prepay postage on letters on May 6, 1840. These first stamps were a one-penny stamp (now known as "The



Acme

**This British Guiana One-Penny Stamp** of 1856 is the rarest stamp in the world. Only one of its kind has ever been found, and it is valued at \$50,000. At the right is a drawing of the stamp's original design. Its color was magenta.



Penny Black") and a two-pence stamp. Complete envelopes designed by W. Mulready were also sold in the same values. But these were not popular and were discontinued.

The United States did not issue any stamps until 1847. By that time several other countries had already tried the newly invented stamp. Among them were Brazil, Mauritius, and the states, or cantons, of Switzerland. By 1860 almost every country had adopted stamps as a method of paying postage.

No one knows exactly when stamp collecting started.

It probably occurred right after the first stamp was issued. We do know that the first stamp catalog was published in 1864 by an Englishman named Mount Brown. Since then catalogs of stamps have been published in every civilized country. A great many books and magazines about stamps have also been published.

People soon discovered that some stamps were harder to find than others, because smaller quantities of them were printed. Even in the early days collectors looked for these rarer stamps. Collectors traded rare stamps and soon began to sell them to each other. Prices were low in the beginning. But when more persons collected stamps, prices began to go up. A one-penny stamp issued by British Guiana in 1856 is now valued at \$50,000. Only one copy of this stamp is known. Other stamps which were issued in small numbers are very valuable. Sometimes errors are made in printing a stamp. For example, the center may be upside down, or the wrong ink or paper used. Stamps of this kind are usually very rare, and become greatly valued.

#### Ways in Which Stamps Differ

Small differences in stamps mean a great deal to the stamp collector. Stamps which look the same to the beginner might seem entirely different to the expert.

Philatelists study many things, such as the paper and inks used, the way the stamps are separated, the printing process, and postal history.

**Paper.** The surface of paper may be finished in various ways. Paper with a plain finish is called *rove*. Paper which looks as though it has bars in it when it is held up to the light is known as *laid*. Tiny pieces of colored silk like those in a dollar bill are used in *silk paper*.

Pieces of silk so small they can hardly be seen are used in *granite paper*, which is grayish in color.

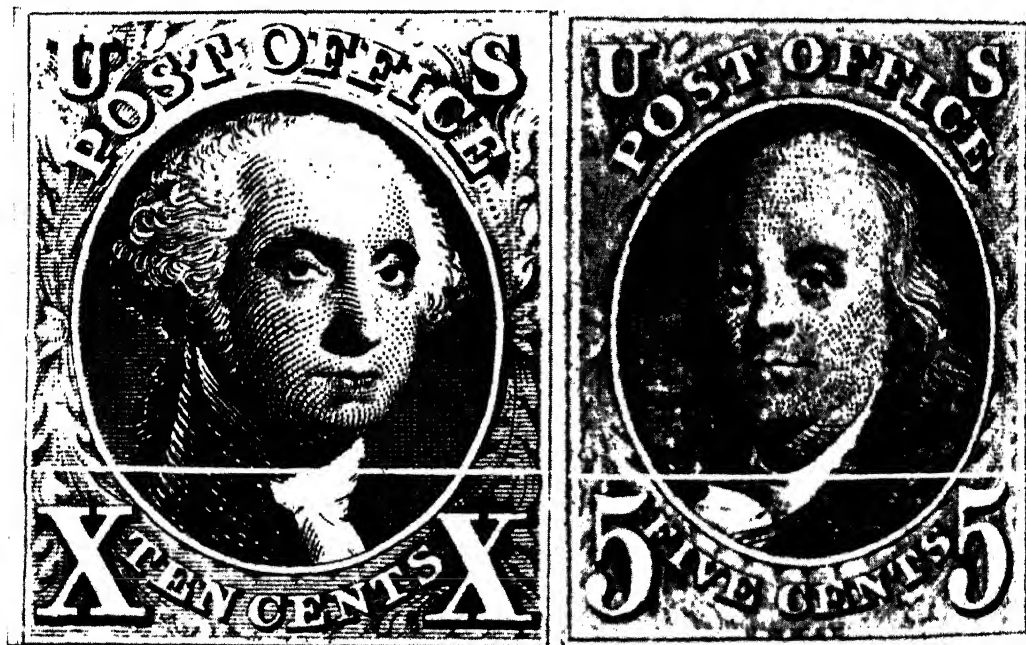
Sometimes paper is made with a design called a *watermark*, which is pressed into the wet paper with wire. The wire can be laid in any shape wanted. Stamps may look the same on the surface, but have different watermarks. Philatelists consider these as different stamps. The watermark can be seen by holding the stamp up to the light, or by placing it face down in a black dish and pouring watermark fluid on it.

**Ink.** Stamps are printed with different colored inks. Variations of the color of the basic ink make the stamps different for the collector. For example, a blue stamp differs from an ultramarine stamp.

**Printing.** A stamp may be printed by one of three methods — *relief*, *planographic*, and *intaglio*. Relief printing is made from a raised design. Planographic printing is made from a design level with the surface, and intaglio is printed from a design cut lower than the surface. The most common forms of planographic printing are *offset* and *lithography*. The form of intaglio printing used for stamps is called *engraving*. The ink on such stamps is slightly raised, exactly as the ink is on an engraved calling card.

**Separations.** The first stamps had to be cut apart with scissors. Such stamps are called *imperforate*. Soon little holes, or perforations, were punched between the rows of stamps. Stamps which have a different number of holes per inch along any edge are also considered as different stamps. Sometimes the separations are slits cut with a knife between the stamps, but with no paper punched out. This form of separation is called a *roulette*.

**Cancellations.** The lines printed on a stamp to show



The First Stamps of the U.S. Post Office were issued in 1847. The ten-cent stamp (left) bears the likeness of George

Washington, and paid postage for a two-sheet letter. The five-cent Franklin stamp was for a one-sheet letter.

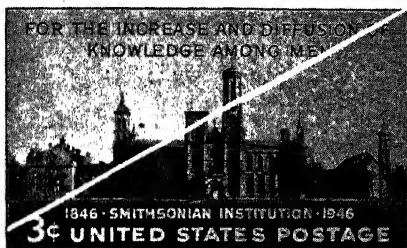
Photos: Charles Hahn



**French Air-Mail Stamp**, used in French Equatorial Africa, commemorates the end of World War II with a victory design.



**The United States Honored France** in this stamp, issued during 1943 as a tribute to the war-torn nation's fight against Nazism.



**United States Commemorative Stamp of 1946** honors the Smithsonian Institution. It is typical of United States commemorative stamps.



**President Franklin D. Roosevelt** is shown studying his stamp collection, in this memorial stamp issued by Nicaragua in 1946.



**Poland's Government-in-Exile** issued this stamp during World War II. It honored Polish soldiers who fought at Monte Cassino, Italy.

## STAMP COLLECTING



**Cape of Good Hope Triangle Stamp** of 1853 was the first oddly shaped stamp.

UNDER THE AUTHORITY OF  
A. FARLEY, POSTMASTER GENERAL

BY THE  
DEPARTMENT  
OF REVENUE AND  
POSTS



85th ANNUAL  
EXPOSITION OF THE  
CITY OF PHILADELPHIA

THE  
NATION OF THE  
AMERICANS

ASHEVILLE, N.C., AUGUST 26-28, 1937.  
PLATE NUMBER 21696

**United States Miniature Sheet**, issued in 1937. Such sheets are made usually for collectors.



**Rare U.S. Air-Mail Stamp** has center upside down.

**U.S. Newspaper Stamp** was discontinued in 1900's.



**German Overprinted** stamp of World War I



**Mexican Commemorative** honors 1946 exposition.

Photos: Charles Hahn





**A Youthful Collector Examines a Stamp** with a magnifying glass, and consults a stamp catalog as he adds new items

that it has been used are called a *cancellation*. Cancellations show postal history. Used stamps are often left on the envelopes, and early stamps are much more valuable that way. Envelopes with a stamp cancelled the first day it was used are called *first-day covers*. Collectors now prize such cancellations.

**Surcharged Stamps.** Countries often change stamps by overprinting (surcharging) something new on an old stamp, instead of issuing a new one. A new value may be printed on an old stamp. When a country is overrun in war, the conquerors often print their names on the stamps of the fallen country. This happened in both World Wars I and II.

**Special Stamps.** Many special types of stamps are issued, in addition to plain postage stamps. A country may honor or commemorate some event or famous person by issuing *commemorative* stamps. The United States issued the first commemorative stamp in 1893. It was called the Columbian issue, in honor of the four-hundredth anniversary of the discovery of America. A stamp which is sold for more than the cost of postage is called a *semipostal*. Part of the price of semipostal stamps goes to a charitable fund. Many countries have issued semipostals, but the United States has never done so.

Many types of special stamps are issued by various countries of the world. Among such stamps are air mail, parcel post, official, postage due, provisional stamps for emergencies, pneumatic tube, special delivery, and personal delivery. Other types include registration, occu-

to his growing collection. He holds the stamp with tweezers to prevent it from being soiled as he puts it into his album.

pation during war, postal savings, newspaper, special handling, and combinations of special services.

**Other Reasons for Collecting.** Not all people collect stamps because they are rare or special, or have certain markings. Many people like to collect them just for the pictures of odd and out-of-the-way places and things. Some people collect stamps of one country only. Others collect only stamps showing birds, or railroads, or ships. Still others collect stamps of only one color, such as purple stamps. Specialists may collect only one issue or even the varieties of just one issue. The reason for collecting really does not matter, as long as the collector has fun doing what he likes.

C.H.A.

See also **Hobby** (Books about Hobbies).

**STAMP WEED.** See **INDIAN MALLOW**.

**STANDARD.** See **FLAG** (Other Names for Flags).

**STANDARD CANDLE.** See **CANDLE POWER**.

**STANDARD GAUGE.** See **RAILROAD** (Tracks).

**STANDARD MONEY.** See **MONEY** (Monetary System of the United States; table, Values of Foreign Monetary Units).

**STANDARD OF LIVING** may be defined in either of two ways. It may be considered as the degree to which wants and needs are satisfied, or it may be considered as the level of consumption of goods and services. Under the second definition, the United States has a very high standard of living. The poorest American family enjoys a variety of gadgets and forms of entertainment that would have made kings of old wild with delight. But

the kings of old would have had plenty to eat, plenty to wear, and a fine place to live. This is not true of at least a third of the population in the United States.

Human beings have many needs and wants. Their basic needs have always included food, clothing, and shelter. To these may be added a number of others, depending upon the society in which a person happens to live. In most parts of the world, artificial light and artificial heat have become basic needs. In the United States, transportation, leisure, schooling, and a sense of belonging to something are generally held to be needs. Throughout the world, a *necessity* is anything without which one cannot live the life that is expected of him. Wants are even less definite than needs. So far as anyone knows, there is no limit to the range of human wants.

The Greek philosopher Epictetus pointed out long ago that unhappiness comes from unsatisfied desires. He could see no way for the ordinary man to increase his satisfactions. So he proposed that people ought to cut down on their desires.

But the modern world as we know it cannot run unless wants are stimulated and appetites whetted. The whole task of the great advertising industry is to build up longings in the public mind. If standard of living is considered as the relation between wants and satisfactions, it is doubtful whether the standard of living in the United States is any higher today than it was in Europe during the Middle Ages.

When we talk about the standard of living of a country, it is a little like talking about the "average man." No country has a general standard of living for everyone, any more than it has an average citizen. We speak of India and China as having very low living standards, but many Chinese live in great luxury, and some of the world's richest men live in India. The size of the average pay check is no indication of a country's standard of living, and the cost of living varies over the world. The man who earns \$100 a year in one part of the world may live better than one who is paid \$100 a week in another place. About the best we can do in estimating national living standards is to divide the total of goods and services available by the total population, and assume that everything is equally distributed. On this basis, the world's standard of living is quite unsatisfactory.

At present the world supports a little more than two billion people. At the American standard of grain consumption, only half this number could live. On the other hand, the world could support an additional billion people at present production if everyone went on the Asiatic standard of living. The whole world with its present population could be supplied with grain at the European standard. This would put an end to starvation and misery in Asia, but it would sharply cut the American standard of grain consumption.

The situation is even more striking when it comes to the more desirable foods, such as meat or dairy products. The North American standard of living calls for about three pounds of meat per person per week. Europe gets about two pounds, and South America about a pound and a half. Asia and Africa use only a third of a pound per person a week. If the world's animal foods were equally distributed, each person would get about a pound of meat per week.

The United States is said to have the highest standard of living in the world. This is true only if we make the standard of living equal the total consumption of goods of all kinds per person. In the matter of providing for basic necessities, Australia and New Zealand both do a better job. The question is whether things like cigarette lighters, pulp magazines, ping-pong sets, and chewing gum should be counted into the standard of living. If they are, the United States indeed enjoys the world's highest standard.

The differences in standards of living in the United States are emphasized by comparing two areas. In some rural regions, the standards are considered lower than in many cities. Such areas may have poor roads, no plumbing, no electricity, and few other comforts that city dwellers find necessary to life. But often these rural areas have fresh fruits, vegetables, milk, and meat when such foods are scarce or high-priced in the city. L.A.C.

**Related Subjects.** Some of the important factors affecting the standard of living today are discussed in the following articles in *THE WORLD BOOK ENCYCLOPEDIA*:

Automobile (Importance of the Automobile)	Industrial Revolution
Communication	Labor
Consumer Education	Poverty
Electricity	Radio
Home Life	Transportation
Housing	Wages and Hours
	War

**STANDARD OIL COMPANY.** In 1859 the world's first oil well was drilled at Titusville, Pa. Three years later, John D. Rockefeller began to build the huge refining industry which was later named the Standard Oil Company. Rockefeller invested money in a new refining process that Samuel Andrews invented. The refinery, which was located at Cleveland, Ohio, grew quickly. In 1870, Rockefeller and a few associates formed the Standard Oil Company and began buying up smaller refineries in Cleveland. Soon, the company had taken over more than twenty other refineries and was the only refining company in the city.

In 1872, the Standard Oil Company began to expand over the whole eastern section of the United States. It bought refineries in New York, Pittsburgh, and Philadelphia. The stock in all these small companies was transferred to the Standard Oil Trust in 1882, and Standard Oil became the biggest name in the petroleum industry. In 1892, the Standard Oil Trust had grown so large that the Federal Government dissolved the company under the Sherman Anti-Trust Law. The company was reorganized as the Standard Oil Company of New Jersey, but in 1911 this firm also was dissolved as a trust.

Today there are thirty-four corporations in the Standard Oil group. They are known by such names as the Standard Oil Company of New York, the Standard Oil Company of New Jersey, and the Atlantic Refining Company. The largest corporation of the group is the Standard Oil Company of New Jersey. It operates in every branch of the petroleum industry, from refining to drilling the wells, and has assets of more than \$1,000,000,000. The Standard Oil companies of California, New York (now Socony-Vacuum), and Indiana are next in size. Each has assets of about \$1,000,000,000. The corporations of the Standard Oil group are now

active competitors and have no official connection. They are prevented by law from forming price-fixing agreements or dividing sales territories among themselves. See also ROCKEFELLER (John D.). R.D.P.

**STANDARDS, BUREAU OF.** See CONSUMER EDUCATION (Testing of Products); NATIONAL BUREAU OF STANDARDS.

**STANDARD SCHNAUZER, SHNOU** *zer.* Sec Dog (color plate, Terriers).

**STANDARD TIME.** In many parts of the world, time is measured by a system called standard time. Railroad schedules are drawn up according to standard time, and official clocks are run on it.

Under the system of standard time, the world is divided into equal zones by lines that run generally north and south. Each zone uses the *sun time* of its central, or *standard*, meridian. The sun time, or true *solar time*, of a particular place is judged from the moment the sun is directly above that place. The sun is then *on the meridian* of that place, and the time is true noon.

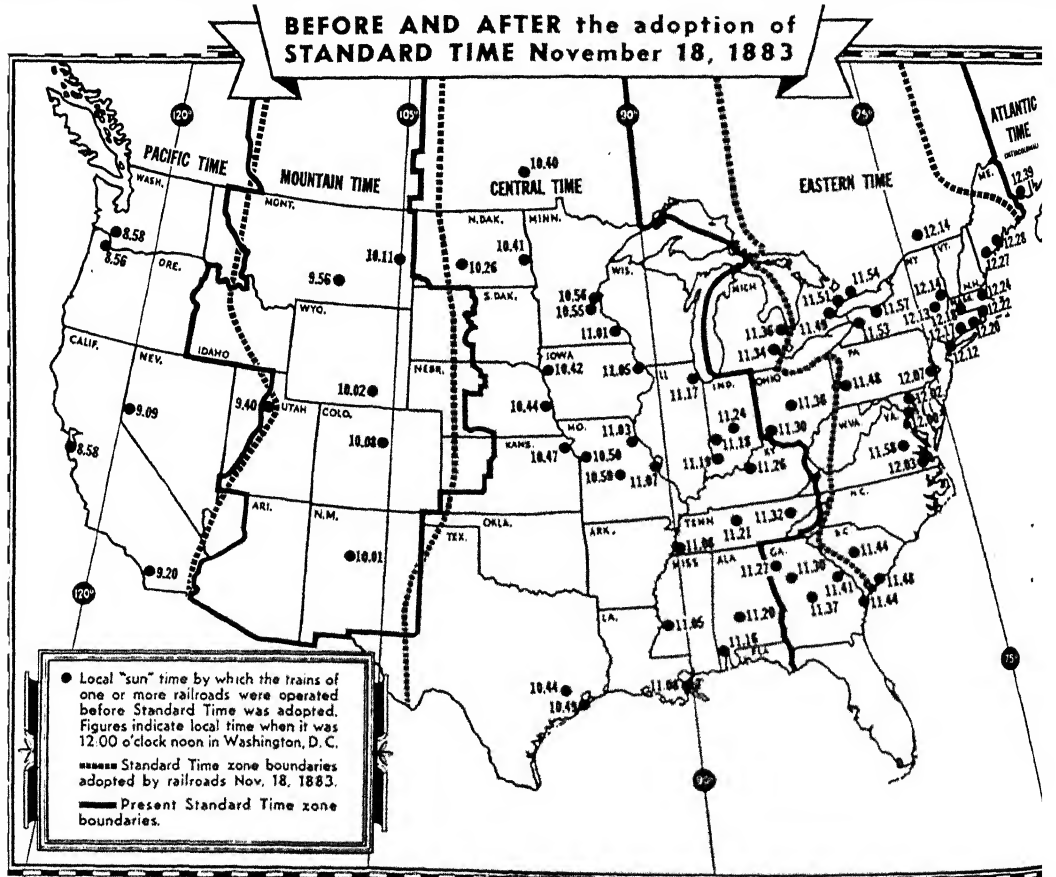
According to sun time, every fraction of a degree of longitude has a different true noon. The spot where the sun is on the meridian changes constantly as the earth rotates from west to east. The sun appears to travel from east to west. The spot where the sun is on the meridian follows the path of the sun and travels entirely around the earth in a day. For example, the

sun is on the meridian at St. Louis, Mo., about an hour later than at New York City. So when it is noon by sun time in New York City, it is only 11:00 in the morning in St. Louis. But the same distance east of New York City, it is afternoon, because the sun has already passed there.

The standard meridians which determine the zones of standard time lie  $15^{\circ}$  apart. This distance was chosen because the sun travels over  $15^{\circ}$  of the earth's surface in an hour. At sea, each zone is cut exactly in half by its standard meridian. The zone extends  $7^{\circ}30'$  east and the same distance west of the meridian. But on land the zone boundaries are often irregular. For example, if a city lies on both sides of a meridian, the zone boundaries are adjusted so that the same time may be used in all parts of the city.

Before standard time was adopted, the differences in local sun time caused a great deal of confusion. The use of local sun time was especially annoying to travelers, because each railroad and city had its own time. The result was that several railroads meeting in the same city might all have different time systems.

Various persons suggested several systems of standard time to remedy this situation. In 1883 William F. Allen proposed the system that was finally chosen. In that year the railroads of the United States and Canada adopted Allen's plan. The railroads' use of standard time soon made it general throughout both countries.



In 1884 an international Prime Meridian Conference was held at Washington, D.C., for the purpose of making standard time world-wide. But only the United States and Canada agreed on the proposed system. Rural communities were the last to accept standard time, but they finally adopted it because it was convenient.

The United States is divided into four standard time zones. These are *Eastern* time, measured by the 75th meridian; *Central* time, measured by the 90th meridian; *Mountain* time, measured by the 105th meridian; and *Pacific* time, measured by the 120th meridian. When it is twelve o'clock noon by Eastern time, it is eleven o'clock in the morning by Central time, ten o'clock by Mountain time, and nine o'clock by Pacific time. North America has four standard time zones in addition to the four in the United States. These are *Atlantic*, *Juneau*, *Central Alaskan*, and *Nome*. P.S.O.

See also DAYLIGHT SAVING; TIME.

**STÄNDERAT**, *SHTEN de RAHT*. See SWITZERLAND (Government).

**STANDISH, MILES**, or **MYLES** (about 1584-1656), was one of the Pilgrim colonists in America. He is remembered chiefly for his association with the legend of John and Priscilla Alden. This story is told in the poem "The Courtship of Miles Standish," by Henry Wadsworth Longfellow.

Standish was born in Lancashire, England. He received little schooling and spent most of his youth in the British Army. Standish fought in the wars in The Netherlands and by 1603 had reached the rank of lieutenant. He was employed by the Separatist or Pilgrim colony in The Netherlands. He did not become a member of the Separatist church, but simply helped the Pilgrims in their plans and in training their militia.

In 1620 Standish sailed with the Pilgrims on the



John Boggs Beale, Modern Enterprises

#### Captain Miles Standish Stabbing an Indian Brave

*Mayflower* and was chosen military captain of the colony after the Pilgrims landed at Plymouth, Mass. Standish had few soldiers, but the Indians greatly feared him. In 1622, when the Indians planned to attack both Weymouth and Plymouth, Standish stopped them. He attacked their camp with only eight men, and killed their two chiefs.

Standish was also a good businessman. As assistant to

the governor and treasurer of the colony, he helped save the colonists thousands of dollars. In 1631 he and his friend, John Alden, founded the town of Duxbury, named for Standish's estate in England. T.P.A.

**Related Subjects.** The reader is also referred to:

Alden, John, and	Massachusetts Bay Colony
Priscilla Mullins	Pilgrim
Bradford, William	Plymouth Colony
Courtship of Miles Standish	Plymouth Rock

**STANDPIPE.** The standpipe is an auxiliary water pipe, used as part of the fire-fighting equipment in large buildings or for water supply, either emergency or regular, in many cities, both large and small. The term is applied to the large pipe that runs from the street level up to a water tank on the roof. Ordinarily this pipe is empty, but should there be a fire with the automatic sprinklers open and discharging, the tank on the roof would be emptied faster than the usual intake could supply it.

In case of a fire, firemen connect one of the first hose lines to the standpipe of the building, to get water going up to the tank on the roof. In the case of standpipes for city or town use, pressure to the water lines is maintained by the high water level in the standpipe. Except in the case of artesian wells, this high level is maintained with power pumps. R.F.Y.

**STANFORD, LELAND** (1824-1893), was a railroad builder, governor of California, and United States Senator. In 1885 he used much of his large fortune to found Leland Stanford Junior University (now Stanford University) as a memorial to his son, who had died at the age of sixteen.

Stanford was born at Watervliet, N.Y. He had a good secondary education, and then entered an Albany, N.Y., law office. Later he was admitted to the bar and practiced law at Port Washington, Wis. In 1852 he decided to follow his five brothers to California.



Brown Bros.

**Leland Stanford**, California pioneer, was one of the early builders of the West.

There he settled in Sacramento, and made a small fortune by selling miners' supplies. Between 1861 and 1863 he served as Republican governor of California, and did much to hold the state in the Union during the War between the States.

While Stanford was governor, he became interested in a transcontinental railway. With Charles Crocker, C. P. Huntington, and Mark Hopkins, he organized the Central Pacific Railway, of which he was president until his death. With the help of Federal and state funds, they pushed the road eastward until it joined the Union Pacific near Ogden, Utah, in 1869. Then the men turned to building a second transcontinental line, the Southern Pacific. Control of these railways brought Stanford and his associates large land holdings. It also gave them much power in the economic and political life of California, as well as an opportunity to contribute greatly to the development of the state.

From 1885 until 1893 Stanford served as United States Senator from California. H.U.F.

See also STANFORD UNIVERSITY.

**STANFORD UNIVERSITY** is a coeducational, privately controlled university in the Santa Clara Valley, 30 miles southeast of San Francisco. It was founded in 1885 by Leland and Jane Lathrop Stanford in memory of their son, Leland Stanford, Jr. Its legal name is the Leland Stanford Junior University. The university was opened to students in 1891. It owns about 9,000 acres of land.

The various divisions of Stanford include schools of law, medicine, nursing, education, biological sciences,



Stanford University

**The Hoover Library on Stanford University's Campus** is dedicated to the collection of historical materials, so that the world might better strive for peace. The idea came to Herbert Hoover while he was directing relief work for Belgium during World War I. In the tower is a carillon with the largest bell inscribed in Latin. Translated, the words read:

"Because I am called Leopold the royal  
For peace alone do I ring  
Over the waves of the Atlantic."

business, engineering, letters, physical sciences, hygiene and physical education, and fine arts; and a food research institute. The courses of study lead to all the regular academic degrees. The university offers 36 fellowships and 175 scholarships. Part of the biological work is conducted at the Hopkins Marine Station, at Pacific Grove. Advanced and clinical work is carried on in the School of Medicine in San Francisco. The Stanford Library contains more than 600,000 volumes, with specialized departments and a rare book section. The school has many other libraries, including the Hoover Library on War, Revolution, and Peace. Stanford maintains many laboratories and museums.

Average enrollment at Stanford is about 4,600. D.B.F.

**STANHOPE, CHARLES, EARL OF** (1753-1816). See PRINTING PRESS.

**STANHOPE, PHILIP DORMER.** See CHESTERFIELD EARL OF.

**STANISLAS, or STANISLAUS, STAN** is *las*, **SAINT** (1030-1079), is the patron saint of Poland and of the city of Kraków, where he was bishop. He became a saint of the Roman Catholic Church in 1253, and is honored as a martyr.

Saint Stanislas was born at Szczepanowski, Poland, and as a priest he took charge of a parish near Kraków. He was named bishop of Kraków by Pope Alexander II. His outspoken attacks against sin in both low and high places earned him the hatred of King Boleslaw II of Poland. Boleslaw ordered him killed, but could find no guard who would obey his order. Finally he killed the bishop himself. The saint's feast day is May 7. F.J.S.

**STANISLAVSKI, CONSTANTIN (KONSTANTIN SERGEEVICH ALEKSEEV).** See DRAMA (Continental Development and Influence).

**STANISLAW, *stahn NYEES lahlf*, II PONIATOWSKI, *rott nyah TAWF shoo*** (1732-1798). See POLAND (Government and History).

**STANLEY, FREDERICK ARTHUR, EARL OF DERBY.** See DERBY, FREDERICK ARTHUR STANLEY, EARL OF.

**STANLEY, HENRY MORTON, SIR** (1841-1904), was a famous British explorer who did much to open Africa for colonization. But most people remember him chiefly as the man who found David Livingstone.

Stanley was born at Denbigh, Wales, and baptized under the name of John Rowlands. His father died when the boy was only two years old, and he spent most of his youth in a workhouse. At eighteen he sailed as cabin boy on a ship to New Orleans, La. There a merchant, Henry Morton Stanley, adopted him and gave him his name.

When the War between the States broke out in 1861, the young man joined the Confederate army, but was soon taken prisoner. Later he joined the United States Navy and served as an ensign on the *Ticonderoga*. After the war, he took up newspaper work and became a foreign correspondent. In 1869 the New York *Herald* assigned him to find the lost explorer, Livingstone. See BENNETT, JAMES GORDON, JR.; LIVINGSTONE, DAVID.

In March, 1871, Stanley started from Zanzibar. After many hardships he reached Ujiji, on Lake Tanganyika, where he found Livingstone. His first remark when he saw the explorer has become famous. It was, "Dr. Livingstone, I presume?" Stanley remained with Livingstone until January.

In England Stanley's story was not believed, and Livingstone's notebooks, which he had carried with him, were at first declared to be forgeries. The English could not believe that a young man of his inexperience



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**Henry M. Stanley, pioneer in the exploration of Africa's interior**



## STANLEY FALLS

had braved the jungle and found a man whom experienced explorers had been unable to find. But Livingstone's son recognized his father's handwriting, and the English were forced to believe Stanley's story.

In 1874 Stanley heard of Livingstone's death and determined to return to Africa and carry on his work. In November of that year he again set out from Zanzibar, with three white men and more than 300 natives. Stanley pushed into the interior of Africa and sailed about Victoria Nyanza and other lakes. Then he began the most important and the most dangerous part of the expedition, a journey down the Congo River from its sources to its mouth. All his white companions and half of his native carriers died before he came to the Atlantic Coast in August, 1877.

The Congo region was rich in rubber and ivory, and Stanley wanted to interest the British in the commercial possibilities of the region. But the British were not interested. Instead, the Belgians colonized the Congo as the Congo Free State. Leopold II of Belgium commissioned Stanley to lead another expedition there, where he remained for five years.

In 1887 Stanley made his last trip to Africa. His purpose was to relieve the Emin Pasha in Egyptian Sudan, who had been cut off after the revolt of the Mahdi. He succeeded in rescuing the Emin Pasha. (See **EMIN PASHA**.) Afterward he returned to England and became a naturalized subject of Great Britain. Stanley was elected to Parliament and served until 1900. J.G.C.

**STANLEY FALLS** is the name of a group of seven waterfalls on the Lower Congo River, in the Belgian Congo of Africa. The falls drop about 200 feet in 60 miles. They were named after Sir Henry Morton Stanley, a famous African explorer. It has been estimated that electric power amounting to 10,000,000 to 15,000,000 horsepower could be developed from Stanley Falls, making this one of the greatest centers of potential power on earth. G.B.C.R.

**STANLEY POOL.** See **CONGO RIVER**.

**STANOVOI**, *STAH nah VOY*, **MOUNTAINS**. This mountain range in Siberia extends for about 1,000 miles from the northern end of Lake Baikal northeast to the Sea of Okhotsk. Most of the Stanovoi Range is more like a rugged plateau than a chain of mountains. The region is rich in minerals, especially gold. The Soviet Union has developed several gold mines there. G.B.C.R.

**STANTON, EDWIN McMASTERS** (1814-1869), was an American statesman. He was Secretary of War in President Abraham Lincoln's Cabinet and later played an important part in the impeachment of President Andrew Johnson.

Stanton was born in Steubenville, Ohio, and was educated at Kenyon College. He studied law and was admitted to the bar in 1836. Stanton practiced in Pitts-



Edwin M. Stanton, Secretary of War during the War between the States

## STAPLE

burgh, Pa., from 1847 to 1856, and then moved to Washington, D.C. There he earned a wide reputation in practice before the United States Supreme Court. James Buchanan appointed Stanton Attorney General in 1860. Two years later, Lincoln made him Secretary of War.

Lincoln did not like Stanton very well, but he admired his abilities. Stanton had a genius for management, and he conducted his office very efficiently.

Stanton was a very outspoken man and he made many enemies. When Johnson became President after the death of Lincoln, he and Stanton clashed continually over the treatment of the South. Congress also opposed Johnson, and impeached him when he tried to remove Stanton from office. Johnson was acquitted by one vote, and Stanton resigned. A few years later President Ulysses S. Grant appointed Stanton Associate Justice of the Supreme Court. But Stanton died four days after the appointment. W.B.H.

See also **JOHNSON, ANDREW**; **TENURE OF OFFICE ACT**.

**STANTON, ELIZABETH CADY** (1815-1902), was an American woman suffrage leader. She launched the suffrage movement in 1848 by

organizing the first woman's rights convention, which was held at Seneca Falls, N.Y. She lived to see great improvement in the status of women. She was born at Johnstown, N.Y., and was graduated from Emma Willard Seminary, Troy, N.Y. In 1840 she was married to Henry B. Stanton, a leader in the anti-slavery movement. On a visit to London, she met Lucretia Mott, an American Quaker minister, who influenced Elizabeth Stanton to call the 1848 meeting. This began her public career, in which she worked for more intelligent divorce laws, and for equal property rights and equal educational advantages for women. She was the first president of the National Woman's Suffrage Association, and served from 1865 to 1890. She was also president of the National American Woman Suffrage Association from 1890 to 1892.

Elizabeth Stanton edited the *History of Woman Suffrage*. In 1888 she presided over the first International Council of Women. Her daughter, Harriot Blatch (1856-1940), was also a suffrage leader. R.M.B.

See also **WOMAN SUFFRAGE**.

**STANTON, FRANK LEBBY** (1857-1927), was a journalist and poet whose songs and verse in Negro dialect were once popular. He was born in Charleston, S.C. For a time, Stanton wrote a column for the Atlanta (Ga.) *Constitution*. Among his many lyrics set to music are "Mighty Lak' a Rose," "L'il Feller," and "Just A-Wcaryin' for You." L.U.

**STAPES**, *STA peez*. See **EAR** (Middle Ear).

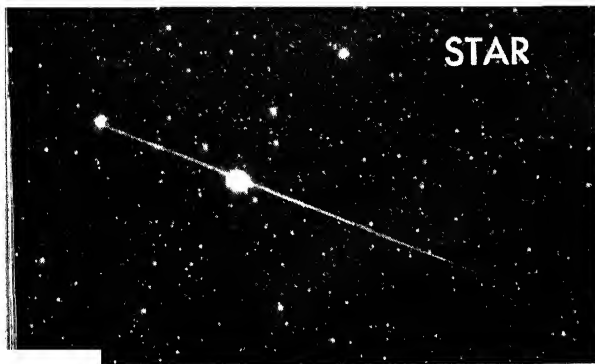
**STAPHYLOCOCCUS**, *STAF ih loh KAHK us*. See **BOIL**.

**STAPLE**. See **COTTON** (Cotton Plant).



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Elizabeth Cady Stanton, American campaigner for women's rights



Howard College Observatory

**STAR.** The stars are suns. Some of the stars are brighter and some of them are fainter than our own sun. There are billions of stars. The nearest star is more than four light years away. A light year is the distance light can travel in a year at the speed of 186,000 miles a second. Some of the other stars are more than 10,000 light years away.

Of the billions of stars in the sky, a person with good eyesight can see about 3,000 at any one time on a clear night. There are about 10,000 stars that are bright enough to be seen, but many of them may be below the horizon at any single time. The total number of stars in the entire sky which astronomers can photograph is about 30,000,000,000.

Ancient man looked up at the stars and wondered what they were, just as modern man does. But instead of examining them scientifically, ancient man grouped the stars into constellations which were really nothing but figures that the stars seemed to make in the sky. The ancient Greeks thought one group of stars looked like a winged horse, and they named that group Pegasus. Other groups of stars were named after animals, such as bears, fishes, rams, or the bull. The animals the groups of stars were supposed to represent became part of the legends and folktales of ancient peoples.

The stars were also used as guideposts in the sky. The North Star helped sailors find their way across the sea. Desert caravans used other stars to guide them.

### The Largest Stars

Our sun is a great round mass with a diameter of 865,000 miles through. This is probably the average diameter of most of the stars. Some stars, however, belong to a special class known as white dwarfs. They are hardly more than 25,000 miles in diameter. There are also giant stars such as Antares, whose diameter is about 390,000,000 miles. Alpha Herculis is also a large star. One star, Epsilon Aurigae, might be called a supergiant. Its diameter is about 2,400,000,000 miles. The masses of the stars vary as their sizes do. The heaviest-known stars weigh nearly 100 times as much as the sun. One of the lightest stars known weighs about one seventh as much as the sun. The sun itself weighs 330,000 times as much as the earth. Some of the stars apparently change size from time to time.

### What Are the Stars Made of?

The astronomer uses a telescope to collect light from distant stars. Then he passes this light through an instrument called a spectrograph, which breaks it up into various colored bands. By analyzing these bands, the astronomer can tell which chemical elements are found

## STAR

in the stars. Among the more abundant of these elements are hydrogen, helium, calcium, and iron. So far as we can tell, all the stars, including the sun, are made up of about the same elements we find in the earth. But these elements are not necessarily found in the same proportions in the various stars.

The spectrograph also tells us the approximate temperatures of the outer layers of the stars. The sun's surface temperature is about 10,500° Fahrenheit. The surface temperatures of most of the stars range from about 5,000° to 25,000° F. A few exceptional stars may have surface temperatures as high as 100,000°. Others may have surface temperatures as low as 3,500°.

We cannot measure the temperature inside the stars directly. But astronomers believe that the farther you go inside a star, the higher the temperature. Near the center of the stars they believe the temperature must be over 30,000,000° F.

Astronomers believe that the stars are made up of gases. All the elements we know would be turned into a gas at all except the very lowest temperatures found on the stars.

### How Far Are the Stars?

For thousands of years, astronomers wondered how far away the stars were. The distances in outer space were not measured with any degree of accuracy until about 1840, however. Very simple principles are used in one method of finding the distances of the stars. In Figure 1, let C be a comparatively close star, and S the sun. A circle represents the path the earth travels around the sun. A and B are two different positions of the earth in this path. If we look at a star C from A the star will appear in line with some distant stars. Six months later, however, when we look at the star from B it will be seen in

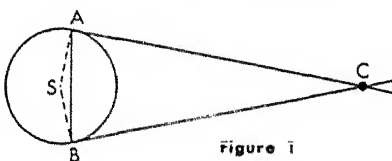


Figure 1

(Distant Stars

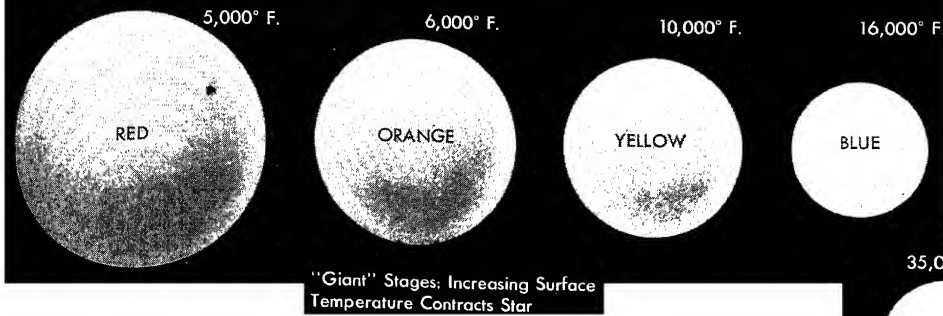
a slightly different direction with respect to the distant stars. This difference of direction is equal to the angle at C. We know SA is 93,000,000 miles. Therefore, by using trigonometry, we can calculate the lengths BC and AC, or the distance from the earth to the star.

The nearest star we have found is the Alpha Centauri. It is so far away that the angle at C is only one and one-half seconds of an arc. If we stood on Alpha Centauri, the earth's orbit about the sun would look about as big as a dime seen from a distance of one and a half miles.

The distances of the stars are so vast that we do not use ordinary units of measurement for them. Instead we think of their distances in terms of light years. Alpha Centauri, the closest star, is 4.3 light years distant.

This method of measuring the distance of the stars has given us the distances of several thousand stars up to 300 light years away from the earth. There are two other methods which are used to determine the distances of stars which are farther away. These depend upon discovering the absolute brightness of the star as

## LIFE CYCLE OF STARS



it really is, and comparing it with its apparent brightness as it looks to us. This method uses what is called the period-luminosity law, and is applied to the stars called *Cepheid variables*.

The other method is known as the method of spectroscopic parallaxes. This method depends upon the fact that certain lines in the spectra of the stars vary in their relative intensity with the absolute brightness of the stars. If we photograph a portion of the spectrum of the star in which these lines are found, and measure their relative intensities, we can determine the absolute brightness of the star with moderate accuracy.

The absolute brightness of a star is then compared with its apparent brightness. By thus knowing how bright a star really is, we can easily determine how far away it is, because we know how much light is lost for a given distance. This spectroscopic method is the quickest way to determine how far a star is from the earth. It has already been applied to many thousands of stars.

There are other methods of measuring the distances of the stars. But these three are most important.

There are 49 stars within 16 light years of the earth. These stars include the sun. On the average, these stars are seven light years apart.

As we get farther and farther from the sun we find that in general there are fewer stars. Finally we reach a region where there are practically no stars. This means that the stars in the heavens are grouped together in a limited system. From careful studies made over a period of many years, scientists believe that the stars are grouped together in space in a shape like that of a silver dollar or a pocket watch. This dollar is 100,000 light years in diameter and 10,000 light years thick. There are the most stars in the regions around the center of this group, and they thin out toward the boundaries. The sun and the earth are about 30,000 light years from the center, and about in the middle so far as thickness is concerned.

This system of stars is called by a variety of names such as the *stellar system*, the *galactic system*, the *galaxy*, or the *Milky Way system*. But as a result of careful research we now know that our galaxy is only one of millions of galaxies scattered throughout space to distances of 500,000,000 light years. No galaxy has been found which is larger than our own, and only a few are known to be as large.

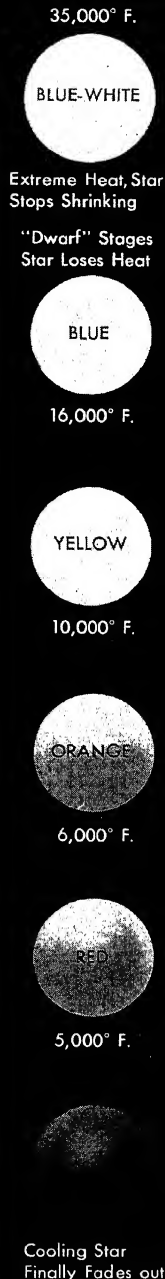
### The Movements of the Stars

The most obvious movements of the stars are not caused by the stars themselves. The stars seem to rise

and set because of the rotation of the earth. Also because of the rotation of the earth, the stars seem to revolve about two opposite points in the sky. These two points are called the north and south celestial poles. They are the points above the two ends of the axis of the earth. If we point a camera toward one of the celestial poles and take a long exposure of the stars at night, the stars will make trails of light which are arcs of circles.

The ancient people tried to distinguish between the planets or the wandering stars and the true stars themselves, which did not appear to move. But the stars do move. One movement of the stars is known as *proper motion*. For example, the stars in the Big Dipper are constantly, but slowly, changing their positions with respect to each other. *Radial motion* refers to the motion toward or from us along our line of sight, while proper motion refers to the motion of the stars across our line of sight. The radial motion of the stars can be measured by studying the lines of their spectra. Some of the stars are moving away from us at a rate of about 12 miles a second. Other stars are moving 200 miles a second. The actual velocity of a star is made up of both its radial motion and proper motion.

Another movement of stars is the motion within



## STARLIGHT

Light waves at edges of beam travel through different thickness of air than center ones.

This irregular arrival of light waves gives observer impression of "twinkling."

the galaxy as a whole. Astronomers believe that the stars in the entire galaxy to which we belong are moving around the center of the galaxy. This means that the galaxy as a whole rotates. The sun, which is about 30,000 light years from the center of the galaxy, is moving with a velocity of about 170 miles a second. This means that the sun, and the earth moving along with it, will make a complete circle around the center of the galaxy in about 225,000,000 years.

### How Bright Are the Stars?

The ancient astronomer Claudius Ptolemy drew up the earliest list of the brightness of the stars about A.D. 150. He called about twenty-five of the brightest ones stars of the first magnitude. The stars that were just visible to the naked eye were called stars of the sixth magnitude. The remaining stars were grouped into stars of the second, third, fourth, and fifth magnitude.

This general scheme of measuring the brightness of the stars is still followed, although it has been improved

## STAR

upon. On Ptolemy's scale of magnitude, not all stars in the same group are of the same brightness. Some stars in the same magnitude were brighter than others. The lower the number, the brighter the star. We indicate the brightest stars by writing a minus sign in front of their numbers, or by means of decimal points for figures of less than one. Sirius, the brightest star, has a magnitude of  $-1.6$ . The magnitude of Canopus is  $-0.9$ , that of Vega  $0.1$ , and Altair  $0.9$ . On such a scale the magnitude of the sun is  $-27$ . The full moon has a magnitude of approximately  $-11.2$ .

A first magnitude star, such as Sirius, may be almost 16 times as bright as another first magnitude star such as Regulus on Ptolemy's scale. On the modern scale, a star of any magnitude is 2,512 times as bright as a star one magnitude fainter. This means that a first magnitude star is exactly 100 times as bright as a sixth magnitude star.

After the telescope was invented, it was possible to see stars much fainter than those of the six magnitudes. With the large telescopes, stars of the seventeenth magnitude can be detected. The 100-inch telescope at the Mt. Wilson observatory can photograph stars to the twenty-first magnitude.

The magnitudes considered in these tables are called *apparent* magnitudes, because they deal only with the brightness of the stars as they appear to us. But a faint star near at hand might appear much brighter than a brighter star at a greater distance from the earth. To measure their real brightness, a scale of *absolute magnitudes* has been devised. The absolute magnitude of a star is its apparent magnitude if it were 33 light years away from the earth. The sun's absolute magnitude is  $-4.7$ . A few stars are known whose absolute magnitudes are about  $-15$ , while the brightest star known is  $-19.5$ . The absolute magnitudes of the stars range from about 100,000,000 times brighter than the sun to about one millionth as bright.

### Variable Stars

Most of the stars we know are remarkably constant in the amount of light they give off. But there are thousands of stars whose brightness varies. These are called variable stars.

There are several different kinds of variable stars. Some of them are classed as *irregular* variables because the variation in their brightness follows no regular law. A second kind of variable stars is the *eclipsing* variables. These are actually pairs of stars that lie so close together that they are bound together by their mutual gravitation. They swing around their center of mass in periods ranging from a few hours to years. At half of every period of rotation, one star will come in front of another. A half-period of their rotation later, their positions are reversed and an eclipse of the other stars occurs. The classic example of such an eclipsing variable is the bright star Algol in the constellation Perseus. It goes through a complete cycle change in about 2 days, 21 hours.

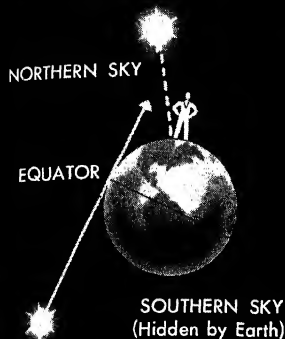
A third kind of variable star is called the *Cepheid* class, because the first of these variables were found in the constellation Cepheus. These stars are larger than the sun. Their periods of variation range from a few hours to more than 30 days, but the period of any

## WHY THE NORTH STAR DOES NOT RISE AND SET

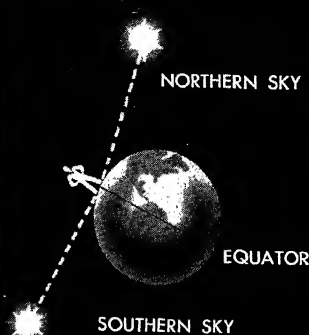
The North Star is directly over axis of the earth

So rotation of the earth does not affect the position of the star as it is seen from the earth

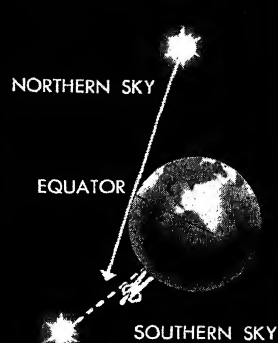
## YOUR POSITION ON THE EARTH DETERMINES WHICH STARS YOU SEE



If you are north of the equator you see only stars of the Northern sky



From the equator you can see stars of both Northern and Southern skies



If you are south of the equator you see only stars of the Southern sky

one of these stars remains remarkably constant. Delta Delphi goes through its complete cycle in a little over five days. In this time it gains and loses about  $1\frac{1}{4}$  magnitudes. This means that it is about three times as bright at its maximum light as it is at its minimum light.

The Cepheid variables have a very remarkable characteristic because their period of variation is directly related to their absolute magnitude. This relationship is called the period-luminosity law. If we can find a Cepheid variable, and, by watching it, determine its period of brightness, we can arrive at its absolute magnitude from the period-luminosity law. Then the difference between its average apparent magnitude and its absolute magnitude is a measure of the distance of the star.

The long-period variables include the largest group of the variable stars. The periods of these stars average about a year, and are not constant for any given star. If the period averages one year in length, one rise to maximum brightness and decline may take 11 months at one time and 13 months at another. All these long-period variable stars are giant stars much larger than the sun.

The nova type variables are the most spectacular type of variable stars. A star of this class seems to be an ordinary star. Suddenly, for some unknown reason, it becomes very bright. This increase in brightness may be as much as ten or fifteen magnitudes, that is, the star becomes 10,000 to 1,000,000 times as bright as it was only a few days

before. Then, in the course of a year or two, the nova gradually fades to its former brightness. No single theory is yet available to explain this explosion of a star.

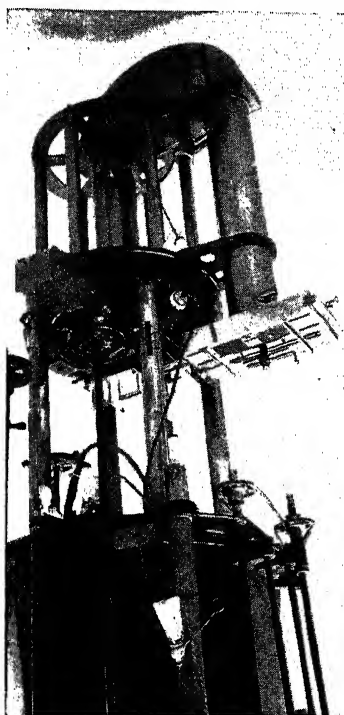
The best explanation so far is that the outer and cooler layers of the star have been blown off by an explosion inside. Therefore the much hotter interior becomes exposed to view. When the new outer layers have cooled off, the star fades back to its old brightness.

### The Stars as Signposts

Since the earliest times, men have used the stars to help guide them across the trackless deserts and the seas. By observing them at set times, they have been able to determine their own position on earth. Stars also help surveyors locate the meridians and parallels on which land surveys and boundary lines are based. Astronomers use the movements of the stars to determine and measure time.

In the Northern Hemisphere almost anyone can tell the position of Polaris, the polestar, by means of the two stars called pointers in the Big Dipper. The polestar is never more than a degree away from true north. Stars also rise due east and set due west, and can be used to determine these directions. The two stars Altair and Procyon rise and set less than  $10^\circ$  north of the east and west points.

In the Southern Hemisphere, there is no polestar like Polaris in the north. The little constellation of the Southern Cross might be used to indicate south, if the necessary allowances are made, because this constellation is  $30^\circ$  from

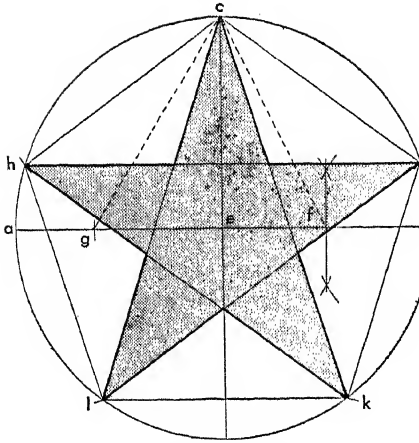


Yerkes Observatory

### A Camera for Photographing the Stars.

The spectroheliograph is a huge, complicated instrument which combines a powerful camera and a reflecting telescope. The camera itself is the oblong box on top of the tube at the left. Spectroheliographs are used by observatories for photographing heavenly bodies invisible to the naked eye. They are also used for analyzing lights from various sources, and for measuring the exact distance between one heavenly body and another.





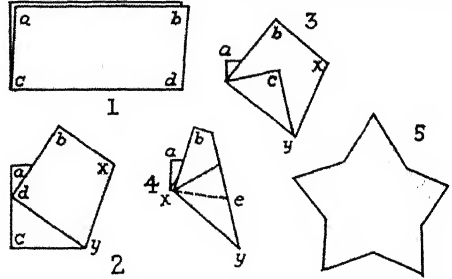
**How to Make a Star.** This geometric drawing can be made by drawing a four-inch circle. Draw the horizontal and vertical diameter ab and cd. Mark the point of intersection e. Bisect eb and mark the point of intersection f. With f as a center, and cf as a radius, describe an arc cutting ae. Mark the point of intersection g. With gc as a radius and c as a center, describe two arcs cutting the circumference at h and i. With h and i as centers and the same radius, describe arcs cutting the circumference at k and l. Form a star by connecting c and l, c and k, h and k, h and i, and h and j.

the southern pole. The same stars used in the Northern Hemisphere can be used in the Southern Hemisphere to indicate east and west.

#### The Age of the Stars

Astronomers think that the stars, the sun, and the earth are all about the same age, or about ten billion years old. About ten billion years ago some great event

must have occurred in the heavens. Some gigantic force broke up the matter in the universe into its present units. Since that time, no great changes have taken place in our universe. We cannot talk about the evolution of a star, because the star has probably not changed greatly from what it was shortly after the great catastrophe that created the universe. It would take observa-

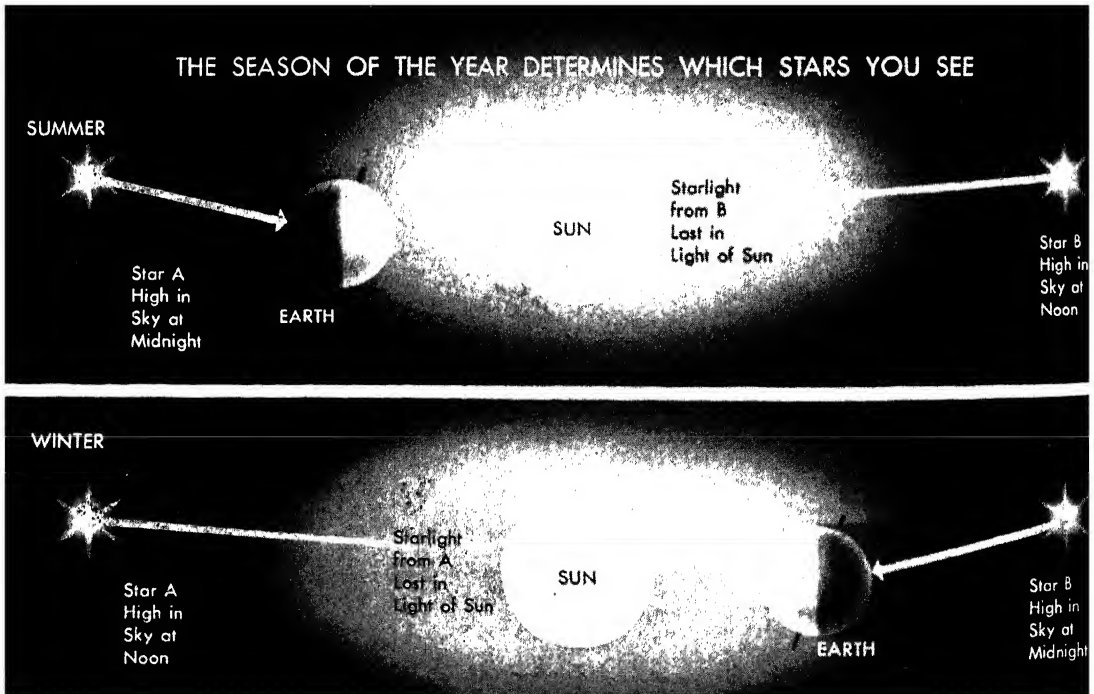


**How to Cut a Star.** The drawings show how a star may be cut quickly by folding paper. Cut on the dotted line, x to e.

tions that extended over thousands of generations to find out how the physical characteristics of the stars change with the passage of time. E.A.F.A.

**Related Subjects.** The reader is also referred to:

1.	Magnitude
Antares	Meteor
Areturus	Milky Way
Astronomy	Mira
1.	Nebula
Cepheus	North Star, or Polestar
Comet	Nova
Constellation	Parallax
Dark Star	Planet
Double Star	Sidereal Time
Fixed Star	Sirius, or Dog Star
Galaxy	Sun



## DIFFERENT USES OF STARCH

Starch plays an important part in our everyday lives. It is found in many foods. Rolls, potatoes, piecrust, pie thickening, and meat sauce all contain starch. It is also used to stiffen and beautify clothing. The menu paper is stiffened with starch. The tablecloth, waiter's shirt, napkin, and jacket would be limp and unattractive if starch were not used on them. The woman's calico dress was printed by a process which used starch. A starch-finishing process is responsible for the smooth fabric of her long gloves.



### Questions

How many stars can a person with good eyesight see in the sky on a clear night?

About how many stars can astronomers photograph?

How did the ancient people explain the stars?

What are *white dwarfs*? Which star might be called a supergiant?

How does the astronomer discover the chemical elements in stars?

What is the temperature of the sun? Of the hottest stars?

What is the nearest star? How far away is it?

How can you discover the direction true north by the stars?

**STARBOARD.** See **SHIP** (Nautical Terms).

**STARCH** is a soft, white, shiny powder which comes from the living cells of plants. It is plentiful in corn, wheat, rice, potatoes, and root foods such as arrowroot and sago. Starch is a carbohydrate, made up of carbon, hydrogen, and oxygen. It is one of the most important foods, and is an active producer of body energy and heat. Digestion changes starch chemically and it circulates through the body as *glucose*, or *dextrose*. It is highly nourishing, but should be eaten along with other foods.

Starch is made only in those plants which contain *chlorophyll*, a green coloring matter. Water and carbon dioxide must be present. The starchmaking takes place only under the direct influence of sunlight. Chemists and botanists do not understand just how the chlorophyll bodies use water and carbon to make starch. George L. Goodale of Harvard University compared the starch-making leaf with a flour mill. In the mill the raw material (wheat), with the energy of mechanical power, is made into flour. One of the by-products of this process is bran. In the plant, carbon dioxide and water are made into starch. Sunlight is the energy, and the by-product of this process is oxygen.

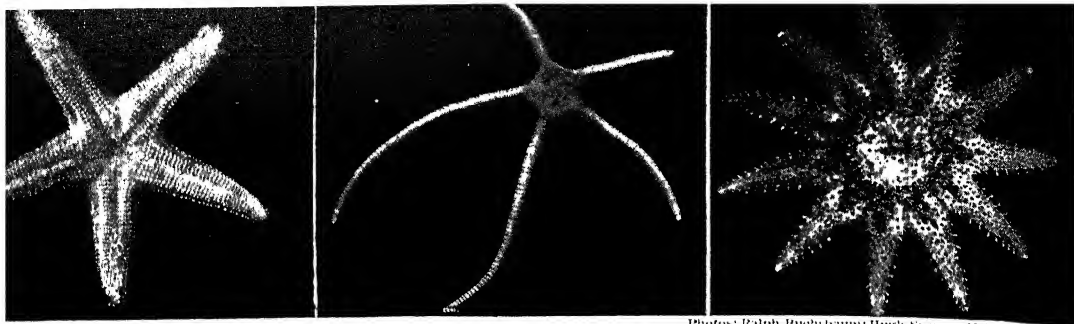
Under a microscope many starches are seen to be tiny oval or pear-shaped grains. These have a central portion, or *hilum*, and a series of envelopes which have a common center. Starches from corn, rice, potato, and other plants have a characteristic appearance under the microscope. This helps in detecting adulterated foods. For example, an expert can tell if expensive arrowroot starch has been adulterated with the cheaper potato starch.

Starch will not dissolve in water, alcohol, or ether. In boiling water, the grains swell and break up, and make a stiff paste when cooled. A sure test for starch is to add tincture of iodine to starch paste. A deep-blue color is produced. Heat makes this color disappear. This test helps to determine the presence of starch in foods. Starch will change to a yellowish substance called *dextrin* if it is heated dry, as is done in the toasting of bread or cereals. The starch in bread dough is changed to *glucose* by fermentation. This is further changed into alcohol and carbon dioxide. Bread "rises" through the action of carbon dioxide released by yeast cells.

Starch is also used in laundering, finishing certain textiles, and thickening material in calico printing.

**Cornstarch** comes from maize and is widely used. It is separated from the grain by soaking it in warm water for a long time. Then it is crushed between cylinders and strained through a sieve. The milky fluid flows over a series of inclined surfaces. The heavier grains are left behind, and the lighter particles flow into settling tanks. The deposit in the tanks is purified by a series of strainings, and dried by artificial heat.

**Industrial Starches** are made largely from wheat, rice, and potatoes. Commercial starch is made by first kneading flour into a stiff paste. This is washed over a fine sieve, which separates the starch from the gluten. The gluten remains in the sieve as an elastic, sticky mass. Gluten is used in macaroni. Potato starch is



Photos: Ralph Hochbaum; Hugh Spencer; Nature Magazine

**Tube Feet Ending in Suckers** are easily seen on the starfish at the left. It has been turned on its back to show the hundreds of suction cups that cover the underside of the arms. In the center is the serpent starfish, frequently called the brittle star-

fish, because of the ease with which its arms are broken off when it is seized by man or other enemies. At the right is the sun starfish. This particular starfish has eleven arms, but some other starfish have an even greater number of arms.

widely used as an adulterant and as a substitute for other starches. Rice starch is the best type of starch for use in the laundry. L.F.G.

**Related Subjects.** The reader is also referred to:

Arrowroot  
Carbohydrate  
Cellulose  
Cornstarch

Dextrin  
Sago  
Tapioca

**STAR CHAMBER** was the name of an old English court which included a chancellor, a treasurer, the keeper of the privy seal, several justices, and a lord. Its trials were without jury, and it could pass any sentence except death.

As time went on, the Star Chamber developed many abuses, among them the torturing of prisoners in order to get confessions. Its procedure was not according to the rules of common law which protected the accused. During the reign of Charles I (1625-1649), the Star Chamber became notorious in its support of the despotic actions of the King. By means of secret trials and arbitrary judgments it suppressed the opponents of Charles, which aroused popular fury. In 1641 the Long Parliament abolished the Star Chamber.

The term *star chamber* now refers to arbitrary and secret meetings or other actions by any tribunal or authoritative body. J.S.S.

**STARFISH** are not fish, but animals that live in the sea. Usually their bodies have five arms, much like the arms of a star. A few starfish have many more than five arms, sometimes as many as forty. The bodies of some starfish are shaped like a five-sided object, or pentagon. Starfish are related to the sea animals called brittle stars, sea urchins, sea lilies, and sea cucumbers. Like these other animals, the starfish have spiny skins. The spines of the starfish are made up of lime that develops from parts of the animal's skeleton just under the skin.

The central body of the starfish is where the arms come together. On the bottom surface of this body is the central mouth of the starfish. A groove stretches from the mouth out to the tip of each of the arms of the starfish. There are rows of tiny holes in these grooves. The starfish can push out slender transparent tubes, called tube feet, from these grooves. Each of these feet has a sucking disc at the end. The starfish uses these feet to aid it in crawling about. Some starfish are able to escape from their enemies by breaking off an arm in the enemy's grasp. At the tip of each arm of the starfish is a small colored spot, called the eye. The eye

is protected from attacks of enemies by a circle of spines.

Starfish have remarkable powers of *regeneration*. That is, if a starfish loses its arm, it can grow a new one to replace the lost arm. Even if a starfish is cut in two, each one of the pieces of the starfish will develop into a new individual.

Nearly all the central body of the starfish is taken up by a baglike stomach into which the mouth opens. Folds of the stomach extend out into the arms. The chief food of starfish is mussels, oysters, clams, and snails. Starfish are a serious pest on the oyster-breeding grounds of the east coast of the United States. In order to eat an oyster, the starfish uses its tube feet to open the two halves of the oyster shell. It pulls these halves in opposite directions. For a while the oyster can hold its shell together, but after a while its muscles must relax, and the oyster shell opens. Then the starfish pushes its own stomach inside out through its mouth opening and surrounds the soft body of the oyster. The oyster is then digested and the food is absorbed into the starfish's body.

Starfish are found in all parts of the ocean except near the North Pole and the South Pole. Starfish are not eaten by man, although some kinds of sea cucumbers, relatives of starfish, are eaten in the Orient. But the dried bodies of starfish often make interesting items for a natural-history collection. R.W.M.

See also ANIMAL (color plate, Leading Groups in the Animal Kingdom).

**Classification.** Starfish make up the class *Asteroidea* in the phylum *Echinodermata*.

**STAR GRASS** is another name for one kind of amaryllis flower, the *Hypoxis*. These flowers have six starlike blossoms.

**STARK, HAROLD RAYNSFORD** (1880- ), was Chief of Naval Operations, the highest position in the United States Navy, when the United States entered World War II. Some critics gave Stark much of the blame for the navy's failure to defend Pearl Harbor adequately at the time of the Japanese attack on December 7, 1941. Shortly after the war Secretary of the Navy James Forrestal said that Stark should never again fill a position "which requires the exercise of superior judgment." But the majority report of a Congressional committee that investigated the Pearl Harbor attack cleared Stark of blame.

Stark was born at Wilkes-Barre, Pa., and was graduated from the United States Naval Academy in 1903. During World War I he served both in the Pacific

and the Atlantic. He was named Chief of Naval Operations in 1939, and was relieved of this position early in 1942. During the rest of World War II, he was commander of the United States naval forces operating in European waters. F.S.M.

**STARK, JOHN** (1728-1822), was an American patriot and military leader. He was born in Londonderry, N.H. As a boy he was captured by the Indians, who called him "the young chief." Stark fought with Robert Rogers' Rangers during the French and Indian Wars and rose to the rank of captain.

When the Revolutionary War broke out in 1776, Stark was appointed a colonel. He gave his fortune to his soldiers in order to persuade them to re-enlist. He fought with George Washington at Trenton and Princeton. As commander of the New Hampshire troops at the Battle of Bennington, he led an attack on the British with the order, "There they are, boys. We beat them today or Mollie Stark's a widow."

Stark's victory paved the way for General Burgoyne's surrender at Saratoga. Stark was raised to the rank of



U.S. Navy  
**Admiral Harold Stark** commanded the U.S. Navy when Japan attacked Pearl Harbor.



National Life Insurance Co.

"We Beat Them Today or Mollie Stark's a Widow," shouted General John Stark to his patriot followers, as they marched to fight the British at Bennington, Vt. Spurred by his challenge, Stark's army of farmers and woodsmen won the battle.

brigadier general and later was given command of the Northern Department. N.G.G.

See also STATUARY HALL.

**STARK GENERAL HOSPITAL.** See CHARLESTON (S.C.).

**STARLING.** The starling is a black songbird with a long, sharp bill. It comes from the Old World. Its feathers have a greenish purple or lilac gloss, and are tipped with buff during the winter.

The common starling is a favorite bird in England, where it lives throughout the year, and has greatly in-

creased in number during the last seventy years. The starlings from Norway and Sweden fly south to southern Europe in the coldest weather. They live in large flocks, sometimes even during the nesting season, when most birds pair off by themselves. The birds make their nests in hollow trees, in birdhouses, or in holes in cliffs. The female starling lays from four to seven light blue eggs.

The starling is very helpful to farmers because it eats great numbers of harmful insects. But in the fruit season it is a pest because it also eats many berries, cherries, and even apples and pears. Starlings' roosts in city shade trees and about buildings during the fall and winter are a great nuisance.

About sixty common starlings were set free in Central Park, New York City, in 1890. They have spread as far south as Florida and Texas, and as far west as Utah. Many persons think it was a mistake to introduce the bird into America because it is very quarrelsome and bothers other birds. It is generally considered a nuisance. A.A.A.

See also BIRD (color plate, Birds Seen in the City); GRACKLE.

**Classification.** Starlings make up the family *Sturnidae*. The common starling of England is *Sturnus vulgaris*.

**STAR MAPS.** See ASTRONOMY.

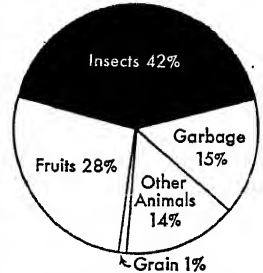
**STAR-NOSED MOLE.** This strange-looking mole has a fringe around the end of its nose. The fringe is formed by twenty-two little fleshy growths, arranged like a star. These growths serve as organs for feeling things. This mole also has a very long tail, which becomes thick during the winter. It lives from Hudson Bay and Labrador to Georgia, and west as far as Wisconsin and Minnesota. The mole makes its home in damp meadows, marshes, and other swampy places. It burrows underground like all moles, but spends more time above the ground than the others. It also likes to swim, and has been known to swim under the ice of frozen streams. This mole makes its nest of grass, weeds, and leaves more than a foot underground. It eats earthworms, grubs, cutworms, wireworms, and various insects. P.R.C.

**Classification.** The star-nosed mole is *Condylura cristata* in the *Talpidae* family.

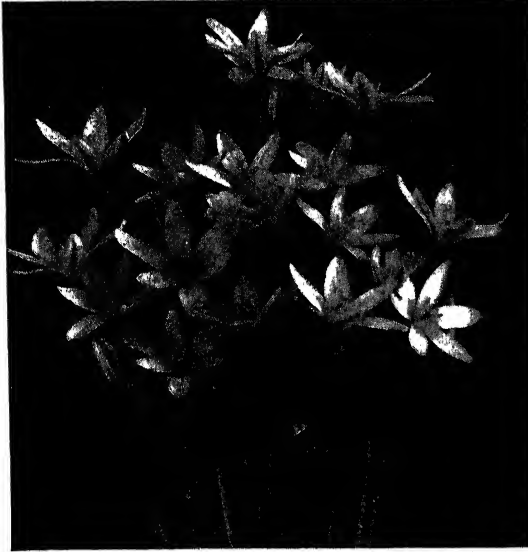
**STAR-OF-BETHLEHEM** is a small, hardy plant that belongs to the lily family. It first grew in Italy, but has become a common garden plant in America. Its flowers form the shape of a six-pointed star. The petallike parts are white, but have green stripes on the outside. This color scheme is repeated in the leaves, which are green with white stripes. The flower stalk rises from a coated bulb.

The star-of-Bethlehem is an attractive plant that is grown in gardens, in greenhouses, and sometimes in window boxes. Its flowers bloom in May and June and have a tendency to close before nightfall. For this reason, the plant is sometimes called *sleepy dick*. A.C.H.O.

**Classification.** The star-of-Bethlehem belongs to the



Food of the Starling



J. Horace McFarland

The *Star-of-Bethlehem* has become very popular in gardens because of its delicate petal formation.

family *Liliaceae*. Its botanical name is *Ornithogalum umbellatum*.

**STAR OF THE SOUTH.** See DIAMOND (Famous Diamonds).

**STARR, ELLEN GATES.** See ILLINOIS (Famous Illinois Men and Women).

**STAR ROUTE.** Some post offices in the United States are located in places which are difficult to reach by train, plane, or boat. The Federal Government makes contracts with private messengers for the delivery of mail to such post offices. The messenger guarantees to deliver the mail quickly, but in any way he chooses. His route is known as a *star route* because post office records indicate such routes with three stars or asterisks. These three asterisks stand for "celerity, certainty, and security."

The messenger receives the bulk mail from the train or boat. He may carry it to the post office for which it is intended on foot, on horseback, by wagon, or by any other way which means as swift and safe service as possible. Star-route service is not the same as Rural Free Delivery. Private messengers handle star routes. Civil service employees take care of Rural Free Delivery.

Star routes became less important as railroads were built throughout the country. But when buses and automobiles began to be widely used, railroads stopped serving many places, and the number of star routes increased.

**Star Route Frauds.** Star routes were very important in the West during the late 1800's. Gangs of politicians and contractors soon saw a way to cheat the United States Post Office. They managed to get contracts for many useless routes and for routes that did not even exist. These illegal gangs robbed the government of huge sums of money, until a great scandal exposed their activities. Trials were held in 1882 and 1883, but the chief figures in the scandal and their accomplices escaped punishment.

R. G. A.

**STARS AND BARS.** See FLAG (Confederate Flags).

**STARS AND STRIPES** is the name of an official army newspaper published during World Wars I and II. The name was first used for a weekly newspaper which was published by the American Expeditionary Forces of World War I. The *Stars and Stripes* of World War II was published in Tokyo, in London, Paris, the Middle East, the Mediterranean area, Manila, and Honolulu.

The World War II publication began as a weekly in London. The first issue came out on April 17, 1942. Later, as the American forces in England grew, it was published daily. *Stars and Stripes* had many troubles with censorship of its stories by high-ranking army officers, especially stories which criticized the treatment of enlisted men by their commanding officers.

The staff of *Stars and Stripes* was usually made up of men who had many years of civilian newspaper training. Their object was to present news of the war and all other information which was of interest to the men of the army.

H. T. M.

**STAR-SPANGLED BANNER.** "The Star-Spangled Banner" is the national anthem of the United States. It was written by Francis Scott Key, and is sung to music composed by John Stafford Smith. The song was officially approved as the national anthem by Congress in March, 1931. But the Army and Navy had recognized "The Star-Spangled Banner" as the national anthem long before it was legally adopted.

**How the Song Came to Be Written.** During the War of 1812, Dr. William Beanes of Upper Marlborough, Md., threw three British refugees into jail. Beanes had captured them after the British had burned Washington, D.C., in August, 1814. Later the British forces took the doctor prisoner and held him aboard a warship in Chesapeake Bay.

Two Americans received permission from Secretary of State James Monroe to communicate with the British in an effort to have the doctor released. The men were Francis Scott Key, a young Washington lawyer, and John S. Skinner, also of the District of Columbia. Key and Skinner boarded the warship just as the vessel was getting ready to bombard Fort Mifflin, which protected the city of Baltimore. The British agreed to release Beanes, but they would not allow the Americans to leave the ship until after the battle. They suspected that the men would reveal the plans of attack to the patriots on shore.

The bombardment started on Tuesday, September 13, 1814, and continued all that day and almost all night. Key and his friends knew that the guns of Fort Mifflin were small and that the fort had few defenders. The prisoners could not sleep, and paced the deck all night wondering how the fort was holding out. Even when dawn came they did not know how the battle had ended because the smoke and haze were so thick.

Suddenly, at seven o'clock, a break in the mist cleared the view for a moment, and they saw the American flag still flying over the walls of the fort. The Americans were thrilled at the sight. Key was so excited that he wanted to express his feelings. He pulled an unfinished letter from his pocket and started writing verses to express his feelings. Key wrote most of the words of the song in a few minutes. Later that day the British released the Americans, and Key returned to a Balti-



more hotel where he finished the other stanzas of this poem.

The poem was printed on handbills the next morning and distributed in the city. Key's brother-in-law suggested that the poem should be sung to the tune of an old English drinking song, "To Anacreon in Heaven." Americans knew the melody as a military march of the 1700's and as a political song named "Adams and Liberty." A few days later an actor, Ferdinand Durang, sang "The Star-Spangled Banner" in Baltimore. This was the first public performance of the song. It became popular immediately, and three months later was played during the Battle of New Orleans. "The Star-Spangled Banner" is now played by military bands at formal retreat ceremonies when the flag is lowered at American forts and garrisons and on special occasions aboard American warships.

By government permission the United States flag is kept flying continually over Key's grave at Frederick, Md. Across the continent at San Francisco, Calif., a great statue of Key looks out upon the Pacific Ocean.

See also ANACREON; KEY, FRANCIS SCOTT. R.KEN.

#### The Star-Spangled Banner

Oh! say, can you see, by the dawn's early light,  
What so proudly we hailed at the twilight's last gleaming?  
Whose broad stripes and bright stars, thro' the perilous  
fight,  
O'er the ramparts we watched were so gallantly stream-  
ing?

And the rockets' red glare, the bombs bursting in air,  
Gave proof thro' the night that our flag was still there.  
Oh! say, does the star-spangled banner still wave  
O'er the land of the free and the home of the brave?

On the shore, dimly seen thro' the mist of the deep,  
Where the foe's haughty host in dread silence reposes,  
What is that which the breeze, o'er the towering steep,  
As it fitfully blows, half conceals, half discloses?  
Now it catches the gleam of the morning's first beam,  
In full glory reflected, now shines on the stream;  
'Tis the star-spangled banner. Oh! long may it wave  
O'er the land of the free and the home of the brave!

And where is that band who so vauntingly swore  
That the havoc of war and the battle's confusion  
A home and a country should leave us no more?  
Their blood has washed out their foul footsteps' pollu-  
tion.

No refuge could save the hireling and slave  
From the terror of flight, or the gloom of the grave;  
And the star-spangled banner in triumph doth wave  
O'er the land of the free, and the home of the brave.

Oh! thus be it ever when freemen shall stand  
Between their loved homes and the war's desolation;  
Blest with vict'ry and peace, may the heav'n-rescued  
land

Praise the Pow'r that hath made and preserved us a  
nation.

Then, conquer we must, when our cause it is just,  
And this be our motto, "In God is our trust."  
And the star-spangled banner in triumph shall wave  
O'er the land of the free and the home of the brave.

**STARTER.** See AUTOMOBILE (Parts).

**STARVATION** occurs when a living thing dies be-  
cause it fails to get enough food or enough of the needed  
kinds of food. Most plants need water, sunlight, and  
the chemicals from the soil. If any of these foods is  
taken away, the plant will die. Human beings need

such elements as minerals, vitamins, proteins, starches,  
fat, and water. When one or all of them is taken away,  
a human being will starve. Adult human beings at rest  
in bed require a diet of about 1,800 calories a day.

People need to eat certain foods because their body  
cells will not work properly without them. Without  
food, a cell has to use up its own parts in order to keep  
working. In time, the vital cells become so weakened  
that death occurs. There are many tales of men who  
have floated for days on the ocean without food or  
water, and lived. Their cells have only been weakened,  
and proper feeding has once again built them up. Many  
persons in Europe who suffered from malnutrition dur-  
ing World War II died after the war ended, when they  
were being fed properly. The reason for this is that their  
cells were so badly injured that they could not be  
rebuilt. See also FAST; NUTRITION. A.C.I.

**STARVED ROCK.** See ILLINOIS (Recreation and Out-  
doors); LA SALLE, ROBERT CAVELIER, SIEUR DE.

**STASSEN, HAROLD EDWARD** (1907- ), is a leader  
of the Republican party. He became known as a "politi-  
cal wonder boy" when he was elected Governor of  
Minnesota at the age of thirty-one.

Stassen, the son of a farmer, was born in Dakota  
County, Minnesota. He was a student leader at the Uni-



Rosenthal, Pix

**Harold Stassen**, a spokes-  
man for the liberals of the Re-  
publican party in the 1940's

versity of Minnesota. He  
studied law, and in 1929  
began to practice law in  
St. Paul. A year later he  
was elected county attor-  
ney and held that office for  
eight years.

As governor, Stassen be-  
gan a series of reforms. He  
revised the civil-service  
laws and lowered the costs  
of state government. His  
law to force a "cooling off"  
period before a strike could  
be called made him na-  
tionally prominent. He was  
the keynote speaker at the

1940 Republican National Convention.

Stassen was re-elected in 1940 and 1942. He an-  
nounced before the 1942 election that he would serve  
only a short time and then would resign to join the  
navy. He did so, and served until the end of World  
War II on the staff of Admiral William Halsey. After  
the war, Stassen advocated liberal and internationalist  
principles. In 1947, he declared himself a candidate for  
the Republican nomination for President. F.S.M.

**STATE.** A group of persons who make their homes  
within a definite territory, and who live under an or-  
ganized government independent of outside control,  
make up a state in the most general sense of the word.  
According to this definition, Sweden is a state, but  
Macedonia is not.

The development of the United States has raised a  
question as to whether the state, in the sense described  
above, can continue to exist. Many persons are coming  
to doubt whether any group on the face of the earth  
can go on being completely independent of outside con-  
trol. They point out that "completely independent

states" which cannot reach agreement must settle their differences by war, and that the atomic bomb has made war too dreadful to contemplate.

**In the United States.** After the American Declaration of Independence, each of the thirteen former British colonies quite properly called itself a state. Each was an independent, sovereign power until the Federal Constitution was adopted. At that time, each gave up a great deal of sovereignty and ceased to be a "state" in the highest political sense. But the name "state" is still used for each of the forty-eight divisions of the United States, partly to emphasize the idea that for certain purposes each one has kept a great deal of sovereignty, or independence.

**Powers of the State.** The United States Government has full control of such matters as foreign affairs, the coining of money, and the collection of customs duties. But each of the forty-eight states has wide powers of government with which not even the Federal Government can interfere. For example, only a state can give anyone the right to vote in a national election.

Each state keeps the police power, which means that it enforces all laws except Federal statutes. A Federal officer can make arrests within a state only for counterfeiting, kidnaping, evasion of Federal taxes, and other violations of national law.

Most corporations are created, not by the national government but by the states. Marriage and divorce are controlled by state laws. Each state has almost complete control over its schools and colleges. Cities, counties, and towns have no rights except those which the state chooses to give them.

**Future of State Powers.** The states of the Union once enjoyed even wider powers than they now have. For example, it was not until the 1900's that the states granted to the national government the power to collect income taxes. Until then, the national government had no right to impose direct taxes upon the people of a state except in proportion to its population.

In recent years there has been a marked tendency to increase the powers of the national government, and thus to reduce those of the states. Often a state must agree to accept some degree of Federal regulation or supervision in order to share in Federal funds for particular purposes.

Many persons want the powers of the states reduced still further. Some believe that there should be national laws on marriage and divorce. Some would like to see a national employment law somewhat like that of New York state, which provides that no employer can discriminate against any racial or religious group. Some want a uniform corporation law, with all firms chartered by the national government.

Strong groups in all parts of the country have always opposed further reductions in state power. They argue that each state has its own problems and special conditions, which cannot be dealt with at the national level, and that it must therefore keep its powers. P.S.W., Jr.

See also GOVERNOR; LIEUTENANT GOVERNOR; STATES' RIGHTS.

**Study of a State.** Every state in the Union differs in important ways from every other state. The best way to study each state is to travel through it, get acquainted

with its people, and become familiar with their customs, their laws, and their ways of making a living. But this task could take a lifetime.

A second way to study each state is to follow an outline. A student who knows his own state thoroughly can, by means of such an outline, give his attention to the ways in which other states are like his own, and the ways in which they are different. An outline suitable for this purpose is given below:

#### Outline

- I. Introduction
- II. The Land and Its Resources
  - A. Facts in Brief
    1. Extent
    2. Physical Features
  - B. Location, Size, and Surface Features
    1. Natural Regions
  - C. Rivers, Waterfalls, and Lakes
  - D. Climate
  - E. Natural Resources
  - F. Conservation and Development
- III. The People and Their Work
  - A. Facts in Brief
    1. Population
    2. Chief Products
  - B. The People
    1. Agriculture
    2. Minerals
  - C. Industries
    1. Manufacturing
    2. Fisheries
    3. Lumbering
    4. Transportation
    5. Press and Radio
- IV. Social and Cultural Achievements
  - A. Facts in Brief
    1. Educational Institutions
    2. State Welfare, Correctional, and Penal Institutions
  - B. Education
    1. Libraries
    2. Arts and Crafts
    3. Religion
    4. Social Welfare
- V. Recreation and Outdoors
  - A. National Parks and Forests
  - B. State Parks
  - C. Other Interesting Places to Visit
- VI. Government
  - A. Facts in Brief
    1. National
    2. State
  - B. Local Government
    1. Legislative
    2. Judicial
    3. Local Government
    4. National Politics
- VII. Famous Men and Women
  - A. Brief Biographies
- VIII. State Symbols and Events
  - A. State Seal
  - B. State Flag
  - C. State Motto
  - D. State Bird
  - E. State Flower
  - F. State Tree
  - G. State Song
  - H. Annual State Events
- IX. History
  - A. Facts in Brief
    1. Notable Dates
    2. Indian Days
    3. Exploration
  - B. Settlement
    1. Early Growth
    2. Progress as a State

**STATE, DEPARTMENT OF.** The Department of State is one of the executive departments of the United States. It was established by Act of Congress in 1789. Through the State Department, the national government receives communications from foreign countries or from individual states of the Union. The department business is divided among a number of offices and divisions which are managed by a group of specialists and experts.

The State Department is a continuation, under another name, of the Department of Foreign Affairs, which was the first executive department established after the adoption of the Constitution. It is thus the oldest ex-

ecutive department of the United States Government.

**The Secretary of State**, like all other Cabinet officers, receives a salary of \$15,000 a year. He is appointed by the President, to whom he is responsible and under whose direction he works. He has charge of negotiation of treaties and of all correspondence with foreign nations. His duties include the publication of treaties, laws, and other public documents, and the preservation of the originals. He is official keeper, or custodian, of the Great Seal of the United States, which must be affixed to proclamations, warrants, and appointments by the President. The Secretary of State also prepares the credentials of American representatives abroad. (See **DIPLOMACY**.) Passports are issued under his authority.

The Undersecretary is the chief advisor to the Secretary of State. His salary is \$10,000 a year. The Secretary is also aided by four assistants, four special assistants, and a legal adviser.

The Secretary of State stands first in the line of succession to the Presidency in the event of the death or permanent disability of the President and Vice-President.

As the chief officer, next to the President, in the executive department of the United States, and as the person responsible for foreign relations, the Secretary of State has almost invariably been a man of outstanding ability. In some instances the Secretary has overshadowed the President who appointed him to his office. P.S.W.,JR.

See also **FLAG** (color plate, Official Flags of the United States [Secretary of State]); **FOREIGN POLICY**; **PRESIDENTIAL SUCCESSION**.

**STATE BANKS**. See **BANKS AND BANKING** (State Banks).

**STATE BIRDS**. See **BIRD** (State Birds; color plate, State Birds).

**STATE COLLEGES**. See the article on each state, under the sections Educational Institutions and Education.

**STATE FLAGS**. See **FLAG** (State Flags).

**STATE FLOWERS**. See **FLOWER** (Floral Emblems and Symbols).

**STATE GOVERNMENT**. See **STATE** and the articles on the individual states.

**STATEMENT**. See **BILL**; **CHECK**.

**STATEN ISLAND**. This small island is part of Greater New York City. Staten Island lies in New York Harbor, about five miles from the southern tip of Manhattan Island. Staten Island is shaped roughly like a piece of pie, and covers an area of fifty-seven square miles. The island is thirteen and a half miles long, and eight miles across its widest part.

Staten Island makes up the borough of Richmond.

Its chief towns are New Brighton, West New Brighton, Port Richmond, Stapleton, Tompkinsville, Tottenville, and Saint George. The population of Staten Island is 174,441.

Ferryboats connect Staten Island with Manhattan and Brooklyn, and bridges connect the island with New Jersey. Fort Wadsworth and Fort Tompkins command a part of the harbor known as the Narrows.

Like Manhattan Island, Staten Island was bought from the Indians by the Dutch.

E.H.L.

See also **FREE PORT**.

**STATE POLICE**. See **POLICE** (State Police).

**STATE PRESS** is a term for all the newspapers and other periodicals which are owned by a government or are under its control. The state press is common in many countries of Europe and Latin America. See also

**NEWSPAPER** (Foreign Newspapers).

**STATES-GENERAL** was a legislative assembly in France which lasted from 1302 until the French Revolution in 1789. It was made up of three estates, or houses. The First Estate represented the clergy, the Second Estate the nobles, and the Third Estate the commoners.

The States-General did not meet at regular times. It was called by the king in times of emergency, or whenever he wanted advice, money, or moral support. The king was the actual ruler, and the States-General had no direct powers, but its influence was at times very great.

By the year 1614, the power of the States-General had declined to almost nothing, and no king called a meeting of the body for 175 years. Just before the French Revolution, Louis XVI summoned the States-General, chiefly to save the government from bankruptcy by devising new taxes.

The assembly met on May 5, 1789. Representatives of the Third Estate demanded that the voting system be changed. Instead of allowing each house to cast one vote, they wanted the voting to be by "head." This change would have made it possible for the Third Estate to outvote the other two houses, which otherwise could always control every decision.

The First and Second Estates refused to accept the change. The Third Estate then withdrew from the States-General and constituted themselves the "National Assembly." Under threats of violence, Louis XVI recognized the National Assembly as the only representative body of the nation. The States-General thereupon went out of existence on June 27, 1789.

**States-General of The Netherlands** was an assembly in which each province had one representative and one vote. It was in existence from 1593 until 1796, when it



**The Gray Granite State Department Building** on Pennsylvania Ave., in Washington, D.C., was completed in 1888 at a cost of \$10,405,850. The building was designed by A. D. Mullet, architect of the Treasury Building. Early in 1947 the Department of State was moved from this building to the one which formerly housed the Department of War, now located in the Pentagon.

became the National Assembly. But today Dutch Parliament is once again called the *Staten General*, or States-General. J.S.S.

**STATESMAN.** See the list of Statesmen in the BIOGRAPHY section of the READING AND STUDY GUIDE.

**STATES OF THE CHURCH, or PAPAL STATES.** See PAPAL STATES.

**STATES' RIGHTS.** When the thirteen American states united in 1789 to form a Federal Government, they gave up many powers to the nation. Any powers not granted to the national government by the Constitution were understood to be kept by the states.

States' rights is a relative term. Everyone has long agreed that the states have rights which the Federal Government cannot lawfully touch. But the Constitution says that the Federal Government can use any powers "necessary and proper" for carrying its specific powers into effect. This means that states' rights can never be exactly defined.

The doctrine of states' rights has not been confined to a section of the country, but is usually advanced by a state or a section when its interests seem to conflict with the policy of the Federal Government. The chief issue in American history has not been the question of whether the states had rights, but rather the question of who should decide when these rights were abused.

The Kentucky and Virginia Resolutions made a strong claim for the right of each state to decide this question for itself. This idea gave rise to the doctrine of nullification, which asserts that a state can nullify within its own borders those acts of the Federal Government which it considers an invasion of states' rights. The doctrine of nullification was developed by John Calhoun and officially adopted by South Carolina in 1832.

In 1860 and 1861, eleven southern states carried the states' rights idea to its most extreme point by declaring secession from the Union. Their defeat in the War between the States put an end to this particular interpretation of states' rights. But it is still generally agreed that the states have a jurisdiction which the Federal Government has no right to invade. The question of drawing the exact line and deciding whether the Federal Government has overstepped it is left to the Federal Courts. E.C.BAR.

See also ALABAMA (History [Early Statehood]); CALHOUN, JOHN C.; KENTUCKY AND VIRGINIA RESOLUTIONS; NULLIFICATION.

**STATE TEACHERS COLLEGES.** See the article on each state, under the sections Educational Institutions and Education.

**STATE UNIVERSITIES.** See the article on each state, under the sections Educational Institutions and Education.

**STATIC, STAT ic**, is a broad term covering any electrical atmospheric disturbance. It is heard as a crashing or grating noise over the radio. It is usually caused by lightning or some other electrical disturbance in the air, but may be caused by motors or other electrical devices, usually when a rotating or vibrating contact is involved, especially one which produces sparks. Every water droplet in a cloud carries a tiny charge of electricity.

As droplets combine to make bigger drops, and finally to make rain, the electricity on the drops adds up, and finally the voltage rises so high that a spark jumps, either to another cloud or to the ground.

There are two sorts of static sounds. Small clouds or isolated water drops give a hissing noise like escaping steam, while large electric sparks give a loud snap or crash. Weather observers, using a kind of radio compass called a radio storm detector, can tell the direction and intensity of a storm by listening to the sound of its static, even when the storm is several hundred miles away.

Static eliminators have been tried in radio sets, but without much success. One of the great advantages of FM radio is that it is not subject to static. P.H.C.

**STATICE, STAT ih see**, is the name of a group of colorful plants that are used in rock gardens and flowerbed borders. Statice is a name given to two large groups of plants known as the *thrift* and *sea lavender*. The thrift has narrow grasslike leaves that grow in large clusters, or bunches. The leaves are evergreen, which means that they remain throughout the year and do not fall off in winter. The flowers are small and very colorful. They may be pink or white, depending upon the species. The sea lavender is a papery everlasting with purple, rose, yellow, or white flowers and wide leaves. These flowers are often dried and used as winter bouquets.

The statice is a hardy plant that grows well in garden soil. It is usually reproduced by seed. Different kinds of statice grow through the Northern Hemisphere, especially in North America and Asia. A.C.HO.

**Classification.** The statice belongs to the leadwort family *Plumbaginaceae*, which includes the genera *Limonium* and *Ameria*. The most common species of thrift are *Ameria maritima*, *A. caespitosa*, and *A. pseudomeria*. A common annual called statice is *Limonium sinuatum*, a perennial, *L. latifolium*.

**STATICS** is a branch of the science of dynamics. Dynamics deals with the properties of matter and forces. It is divided into two branches—*statics* and *kinetics*. Statics deals with conditions under which material bodies do not change motion when acted upon by various forces. That is, a body at rest will remain at rest, and a body in motion will not change direction or speed of motion. When two or more forces act upon a body so as to produce no change of motion, they are said to be in *equilibrium*. Kinetics deals with changes of motion. R.F.P.

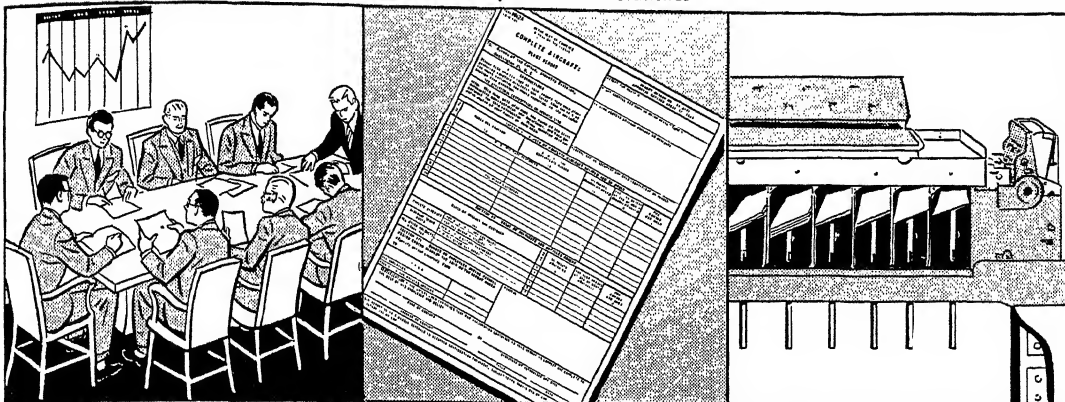
**STATIONARY ENGINEER.** See AIR CONDITIONING (Vocational Opportunities).

**STATISTICIAN, STAR ih SEE an.** See ADVERTISING (Vocational Opportunities); STATISTICS.

**STATISTICS.** If you look up the word *statistics* in the dictionary you will find that it has the same form in the singular as in the plural. But each form has a different meaning. In the plural the word means collections of facts such as the batting averages of all players in the National League. In the singular it means the science of studying such collections of facts, in order to learn new things from them. For example, from the batting averages we might learn that half the players in the National League batted at .280 or above, the other half below.

## HOW STATISTICS ARE COLLECTED AND USED

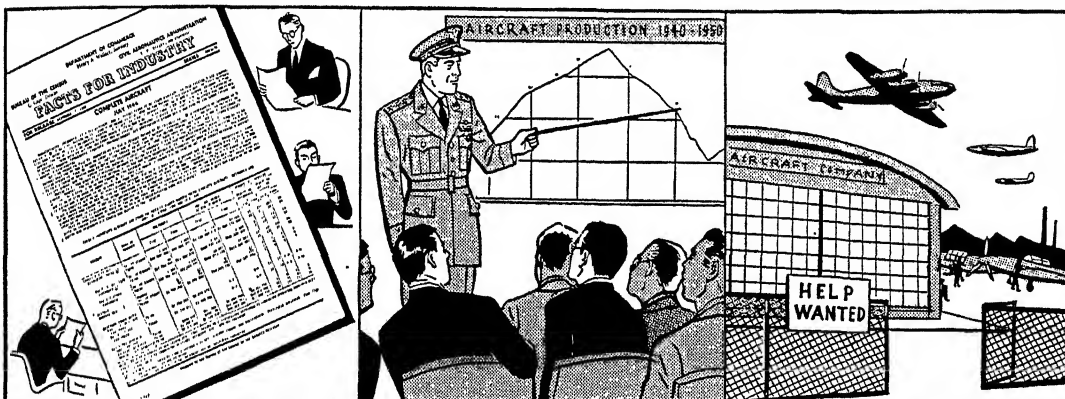
A Case Study in Aircraft Statistics



**Representatives** of government and industry discuss what facts they need on aircraft production, workers, orders.

**A Form** is worked out and aircraft manufacturers are asked to fill in the required facts every month.

**Replies** are transferred to cards. An intricate machine sorts out the answers to the specific questions.



**Executives** in government and industry and statistical experts get the monthly reports from the Bureau of the Census.

**Military Aircraft** orders are planned on basis of industrial activity. Congress studies facts, provides money.

**Industry** buys materials, hires workers, plans advertising, using statistics on orders, income, and production.

The science of statistics starts with a collection of facts. They might be the grades in a college entrance examination. The first thing the statistician does is to arrange the facts in a table. The highest grades are at the top, the lowest at the bottom. To the right of each grade he enters the number of candidates who got exactly that grade.

As simple a table as this helps to draw some conclusions rapidly. A glance will tell you what proportion of candidates failed to pass. You may notice that more of the grades are grouped about 80 per cent than any other percentage. This means that 80 was the most common or "stylish" grade. For that reason it is called the *mode*. You may notice that half the candidates got a grade of 74 or over, half under. This means that 74 is the middle point of the table. For that reason, it is called the *median*.

We might also want to know the average grade. To find the average we add together the grades of all the candidates and divide by the number of candidates. This means that if several got the same grade, that grade

must enter the sum as many times as there were candidates with that grade. In other words, we must multiply each grade in the table by the number that got that grade, and add the results. We divide by the number of candidates to find the average grade. We have in effect taken what is called a *weighted average*. The weights are the number of candidates who got each grade.

The weighted average is also used in statistics when certain of the facts are more reliable than others. In measurements of the same quantity made with different instruments, for instance, it may be that some instruments are more accurate than others. Measurements made with them would be given larger weights.

If the statistical facts in a problem involve hundreds or thousands of items, the statistician is forced to use a shortcut in making the table. Suppose he had to deal with one thousand heights of American men. He could enter them in the table only to the nearest inch. He would count, for example, the number of heights nearer to 5' 6" than to either 5' 7" or 5' 5". He would enter the number opposite 5' 6". The table would contain



perhaps twenty lines, instead of hundreds. The work of finding the ordinary average, the mode, and the median would be greatly reduced. On the other hand, he would not get such accurate results, as if the heights were accurate in the first place.

If the numbers in a statistical table tend to crowd together, it means that the average is very useful in describing the table. The extent of scattering around the average is called the *dispersion*. It can be computed from the table in various ways which are described in technical books on statistics.

A statistical table is also called a *frequency distribution* because it tells how frequently a certain height or a certain examination grade occurs. In the frequency distribution of 1,000 heights, for example, there may be 50 in the line representing 6' 0". This means that you might expect to find fifty out of one thousand, or one man out of twenty, about six feet tall. That is true, at least if the table of 1,000 heights fairly represents the heights of American men.

We can look at the 1,000 heights as a sample of men's heights. The usefulness of a sample depends on how accurately it reflects the collection of things it came from. If a sample of a dress material were faded or stretched it would be a very poor sample and of no value. It would be called a *biased sample*. Also if the sample were so small that it did not show the pattern, it would be of no use.

Returning to the sample of 1,000 heights, we must know whether it is a biased sample. To know this we must know how the sample was obtained. We must be sure that it was selected on a *random* basis, that it does not favor men of any one group or region at the expense of others. If satisfied on this point we ask whether the sample of 1,000 is large enough to represent the entire group of forty-odd million men. The answer to this question depends on what sort of conclusions we hope to reach from the sample. If we wish merely to learn the average height within one to two inches, the sample is probably adequate. If, however, we want to find out the proportion of men more than six feet three inches tall, it is almost certainly a useless sample. We say "probably" because it is possible for a very small sample to have exactly the same average as the entire population. In drawing conclusions from a sample we are in fact using the theory of probability.

**Probability.** Statistics becomes a powerful tool in predicting future events when the idea of probability is added. If we throw a pair of dice we are unable to predict what the next throw will be. But if we throw the dice a great many times we can predict the results quite accurately. We know that on about one sixth of the throws the total on the dice will be seven. On about one thirty-sixth it will be two, and so on. This is an example of a statistical law at work. If we threw the dice 3,600 times and kept a record of results, we would study this record by making a statistical table. This would show us the frequency distribution of the eleven possible throws. There would be about six hundred throws of the seven, five hundred of the six, and so on. In other words, the frequency distribution would tell us the probability of throwing a seven or a six or any one of the other throws.

In dice and in many gambling games it is possible to figure the probabilities without making tedious experiments. But this is seldom true in other fields. To insure a person's life, the insurance company must know the probability that the person will die within a year, within two years, and so on. But no one can compute such probabilities except by the use of statistical tables which are based on experience. In the case of life insurance, these are called mortality tables. Without them there could be no such thing as life insurance.

There is one type of frequency distribution, called a *normal* distribution, that is of great importance in statistics. It is simple and can easily be interpreted by using the theory of probability. In such a distribution the average, the median, and the mode all have approximately the same value.

What this means will be clearer from a graph. To make one of the table of men's heights, for instance, we would lay off the heights along the horizontal axis, and the frequencies along the vertical axis. There would be a point on the graph for each height listed in the table, showing the number of men having that height. We would then connect these points to form a curve. The interesting thing is this: the greater the number

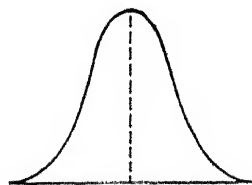


Figure 1

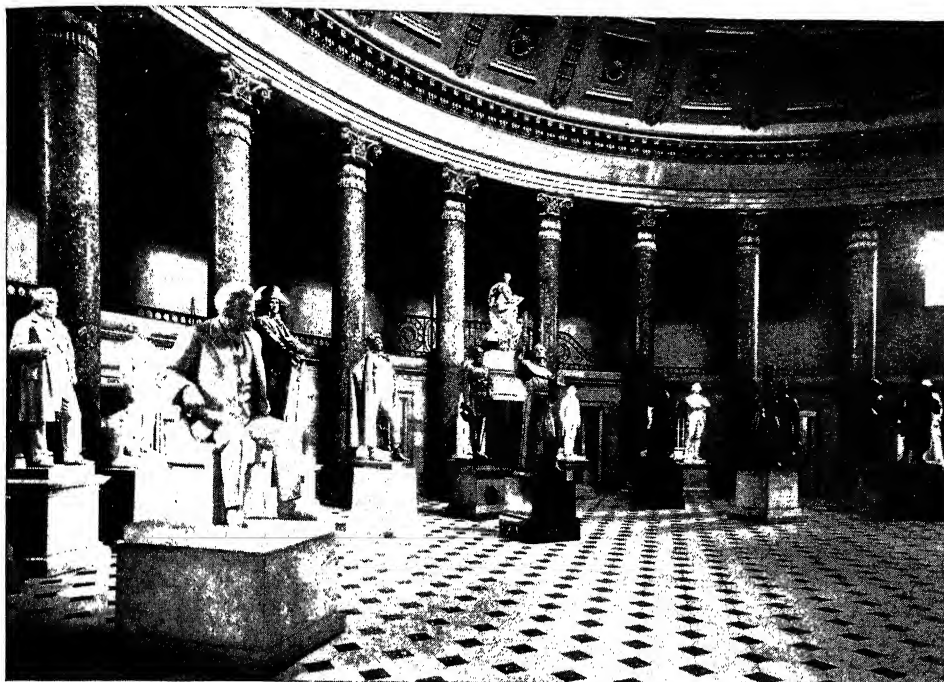
of heights, or the larger the sample, the smoother this curve will be. That is because there is a statistical law at work. It is called Gauss's Law. If there were an unlimited number of heights in the sample, the curve would resemble that in Fig. 1.

The dotted line in the figure represents the average, the median, and the mode. It is clear that the curve is symmetrical about this value. This means that if you folded the paper exactly on this line, the two parts of the curve would coincide.

If a rifle is fixed in place and then is fired at a target a large number of times the pattern of the shots follows Gauss's Law. Suppose the rifle is mechanically held so that it remains pointed directly at the bull's-eye. Draw a circle with the bull's-eye as center so that half the shots are inside. Call its radius  $r$ . Now draw a circle with radius  $2r$ . You will find that about 82 per cent of the shots are within this second circle. Draw further circles of radii  $3r$  and  $4r$ . You will find that respectively about 96 per cent and 100 per cent of the shots are within these circles. The more accurate the rifle, the smaller will be the radius  $r$ . It is called the *probable error*. There is an even chance that the deviation of the next shot fired will be less than the probable error. The chance that the shot will deviate from the bull's-eye less than  $2r$  is similarly  $\frac{82}{100}$ ; less than  $3r$ ,  $\frac{96}{100}$ ; less than  $4r$ , greater than  $\frac{100}{100}$ . As for a deviation greater than  $8r$ , it is next to impossible.

The usefulness of the idea of probable error is not confined to men's heights or artillery fire. It can be used whenever the frequency distribution closely follows Gauss's Law.

If we make a table of men's weights instead of heights we find that Gauss's Law is not followed. This is an



Harris &amp; Ewing

Statuary Hall in the Capitol, Washington, D.C., Houses Statues of Distinguished Citizens from Each State

experimental fact that could not have been predicted. But there is a statistical relation between men's heights and weights. It can be expressed as follows: it is very probable that a tall man weighs more than a short man, and *vice versa*. This is not a hard-and-fast relation like the law of gravitation. It is called a *correlation*. If there were a hard-and-fast relation between these factors there would be no such thing as a tall thin man or a short fat man.

**Uses.** The science of statistics is evidently a powerful working tool in all complicated situations where large numbers of facts enter. We have mentioned examples like artillery fire and insurance. But there are hundreds of other fields where this is the case. In manufacturing and retailing, in finance, in sports and games, in gambling, in education, government, agriculture, public-opinion polls, advertising, and in all the sciences, from the exact sciences like physics and chemistry, through biology and economics to the social sciences, statistics has an important part to play. In many businesses there are from tens of thousands to millions of transactions per year. Statistical methods are required to organize these facts and discover what statistical laws are hidden in them. Public-opinion polls are valueless unless soundly based on the theory of statistical sampling. In physics we have to deal with incredible numbers of molecules, atoms, electrons, protons, neutrons, and so on. All predictions about them, like those that led to the atomic bomb, are based on the wide use of statistical methods.

**Precautions.** Handling statistics soundly is not an easy thing to do. It requires both intensive training and practical sense. The subject is full of pitfalls for the unwary. Because many frequency distributions follow

Gauss's Law it is easy to assume, without proof, that the one you are studying follows it. This has often been done, even in professional studies. It is easy to find relationships (correlations) between things that have no real relation to each other. It is for these reasons that it is so frequently said that "you can prove anything by statistics." So you can, if you use unsound statistics. On the other hand, the statistical method, soundly used, is of the greatest value, and its importance is increasing in many fields.

H.C.L.

**Related Subjects.** The reader is also referred to:

Average  
Babson, Roger Ward  
Business Machines  
Cycle  
Mean

Median  
Pearson, Karl  
Poll of Public Opinion  
Probability  
Vital Statistics

**STATISTICS, VITAL.** See VITAL STATISTICS.

**STATOLITH, STAT** *oh lith*. See EAR (Inner Ear).

**STATOR, STA** *ter*. See DYNAMO (Parts of a Generator).

**STATUARY HALL** is a large room in the Capitol at Washington, D.C., which is set aside to house the statues of outstanding citizens of each state of the United States.

The room is in the shape of a half circle, and is covered by a half-dome ceiling. It occupies part of the main floor of the Capitol. From 1807 to 1857, the House of Representatives met in this room. By act of Congress in 1864 it was made into a memorial hall to honor the men or women which the states consider worthy of recognition. Originally, each state could send two statues to the hall. But in 1934, the number was changed to one. The act as first passed reads as follows:

That the President be, and he is hereby authorized to invite each and all the States to provide and furnish

STATE	IN STATUARY HALL	DATE PRESENTED	ELSEWHERE IN THE CAPITOL	DATE PRESENTED
Alabama	*Joseph Wheeler	1925	J. L. M. Curry	1906
Arizona	John C. Greenway	1930		
Arkansas	*Uriah M. Rose	1917	James P. Clarke	1921
California	*Junipero Serra	1931	Thomas S. King	1931
Connecticut	*Roger Sherman	1872	*Jonathan Trumbull	1872
Delaware	Caesar Rodney	1934	John M. Clayton	1934
Florida	John Corrie	1914	*Edmund Kirby-Smith	1918
Georgia	*Alexander H. Stephens	1926	*Crawford W. Long	1926
Idaho	*George L. Shoup	1909		
Illinois	*Frances E. Willard	1905	*James Shields	1893
Indiana	*Lew Wallace	1909	*Oliver P. Morton	1899
Iowa	*Samuel J. Kirkwood	1913	*James Harlan	1909
Kansas	*John J. Ingalls	1904	George W. Glick	1914
Kentucky	*Henry Clay	1929	Ephraim McDowell	1929
Louisiana	*Huey P. Long	1941		
Maine	Hannibal Hamlin	1935	*William King	1877
Maryland	*Charles Carroll	1901	*John Hanson	1903
Massachusetts	*Samuel Adams	1873	*John Winthrop	1872
Michigan	*Lewis Cass	1889	*Zachariah Chandler	1913
Minnesota	*Henry Mower Rice	1916		
Mississippi	*Jefferson Davis	1931	James Z. George	1930
Missouri	*Thomas H. Benton	1899	*Francis P. Blair, Jr.	1899
Nebraska	*William Jennings Bryan	1937	*Julius S. Morton	1937
New Hampshire	*Daniel Webster	1894	*John Stark	1894
New Jersey	*Richard Stockton	1888	*Philip Kearny	1888
New York	*Robert R. Livingston	1874	*George Clinton	1873
North Carolina	*Zebulon Baird Vance	1916	Charles B. Aycock	1932
Ohio	William Allen	1887	*James A. Garfield	1885
Oklahoma	*Sequoyah (George Guess)	1917	*Will Rogers	1939
Pennsylvania	*Robert Fulton	1881	*John Peter G. Muhlenberg	1889
Rhode Island	*Roger Williams	1870	*Nathaniel Greene	1869
South Carolina	*John C. Calhoun	1909	*Wade Hampton	1929
South Dakota	William H. Beadle	1937		
Tennessee	*John Sevier	1931	*Andrew Jackson	1928
Texas	*Samuel Houston	1904	*Stephen F. Austin	1904
Vermont	*Ethan Allen	1875	Jacob Collamer	1879
Virginia	*Robert E. Lee	1908	*George Washington	1908
West Virginia	*Francis H. Pierpont	1903	John E. Kenna	1901
Wisconsin	*Robert M. LaFollette	1929		1895

\*Names starred indicate a biography in THE WORLD BOOK E.

statues in marble or bronze, not exceeding two in number for each State, of men who have been citizens thereof and illustrious for their historic renown, or for distinguished civic or military services, such as each State shall determine to be worthy of this national commemoration; and that they be placed in the old hall of the House of Representatives in the Capitol of the United States, which is hereby set apart, or so much thereof as may be necessary, as a National Statuary Hall, for the purposes herein indicated.

Many interesting events of history took place in this room before it became a memorial hall. The House of Representatives elected John Quincy Adams as President in the important election of 1825. Twenty-five years later, Millard Fillmore took the oath of office as President here on the day after Zachary Taylor died. Henry Clay presided in this hall as Speaker of the House of Representatives during the bitter debates on the War of 1812, on the Bank of the United States, and on the tariff. Here Daniel Webster, John C. Calhoun, Stephen A. Douglas, and Abraham Lincoln began their careers in the public life of the nation. These and other men discussed the issues which finally led to the War between the States.

F.H.

A list of the statues which now stand in the hall is

given in the above table. The only woman chosen is Frances E. Willard. Her statue was placed in the Hall by Illinois in 1905.

**STATUE OF LIBERTY.** See LIBERTY, STATUE OF.

**STATUTE, *STILL* foot.** is an act passed by a law-making body. *Statute law* is another term for *written law*. The term distinguishes written law from *unwritten* or *common law*, which is based upon custom and upon previous court decisions. See also COMMON LAW. H.G.

**STATUTE OF FRAUDS.** See FRAUD.

**STATUTE OF LIMITATIONS.** A statute of limitations is a law that provides a definite limit of time in which legal action may be taken in certain cases. All legal rights and remedies are barred after the time limit has passed. Statutes of limitations apply to both criminal and civil law. The individual receives a great deal of protection from this statute under civil law. The law prevents lawsuits in which the true situation is cloudy because of a long lapse of time, the death of witnesses, a failure of memory, and other reasons.

Each state has its own laws which set the time limits for different kinds of claims. Most states have a time limit of twenty years on lawsuits involving property



**The Power of Steam**, lifting the cover of a teakettle, suggested to James Watt that the force could be harnessed in an



Photos: Gondreau; Ewing Galloway

engine. The modern locomotive is one of the many powerful machines developed from Watt's steam engine.



**Steam Has Many Uses** other than providing power. Stonework of buildings is cleaned with a steam jet (left) after soap



Photos: Press Syndicate; Ewing Galloway

and acid have been applied to loosen the dirt. At the right, steam operates the whistle of a harbor tugboat.

rights. Ownership of property cannot be contested after one party has had possession for that length of time. One of the first statutes of limitations on debts is found in the Old Testament. The ancient Hebrew law forced a creditor to release a debtor from his obligation after seven years.

For a table on the statutes of limitations on debts in the United States and Canada, see **DEBT**. L.T.F.

**STATUTE OF WESTMINSTER.** See **CANADA, GOVERNMENT OF** (International Relations); **EIRE** (Government).

**STATUTORY LAW.** See **LAW** (Law by Statute).

**STAUBBACH** is the name of the highest waterfall of Switzerland, which is also one of the highest waterfalls in the world. It is 980 feet high. The waterfall is formed from one of the racing torrents of melted snow that cascade down into the Lauterbrunnen Valley in central Switzerland. The waterfall is just outside the city of Lauterbrunnen. G.B.Gr.

**STAVANGER.** See **NORWAY** (Cities).

**STAYSAIL SCHOONER.** See **YACHTING**.

**STEAD, sted, WILLIAM THOMAS** (1849-1912), was an English journalist. He began several of the common practices of modern journalism in England. Stead introduced in English papers the interview, the use of illustrations, and "extra" editions.

In 1890 Stead founded the *English Review of Reviews*, in 1891 the *American Review of Reviews*, and 1894 the *Australasian Review of Reviews*. His weekly paper, *War Against War*, attacked Great Britain's part in the Boer War and did much toward measures for peace. In 1912 he sailed on the *Titanic* for New York City and was drowned when the ship sank. E.S.W.

**His Works** include *The Truth About Russia* and *If Christ Came to Chicago*.

**STEAM**, *steem*, is water which is changed into gas. Steam cannot be seen, for it is colorless. The cloud of

vapor which we see beginning about an inch from the spout of a teakettle is sometimes mistakenly called steam. The real steam is in the space which seems vacant, just outside the spout. The cloud that we see is water which the cooler air has changed from the gas form back into tiny particles of water.

Steam may be caused by boiling or by evaporation. Water boils when it is heated to  $212^{\circ}\text{F.}$ , or the *boiling point*. Water will evaporate at lower temperatures. The steam caused by boiling is as hot as the boiling water. The steam caused by evaporation is not hot. Usually the word steam refers to hot steam.

When water reaches the boiling point, bubbles of steam begin to rise through it and escape into the air. The temperature will remain at the boiling point until all the liquid has become gas. It requires 100 calories of heat to raise one gram of water from the freezing point ( $32^{\circ}\text{F.}$ ) to the boiling point. To change the same amount of boiling water into steam requires about five and one third times as much heat. This heat is called *latent heat* because the steam holds onto it. It is only when steam condenses into vapor that it gives off these 537 calories of heat per gram. But people have been very severely burned by the vapor which appears when steam condenses and gives up its latent heat.

Steam fills more space than the water from which it comes. At the moment when boiling stops, the gas is 1,670 times as great in volume as the former liquid. At this stage it is called *saturated steam*. If heated more, it takes up even more space. Then it is known as *superheated steam*. The steam engine is built around this ability of steam to expand. *Wet steam* supports particles of water still in liquid form. *Dry steam*, however, contains only gas.

L.M.

See also BOILING POINT; CIVILIZATION (Middle Civilization; Higher Civilization); EVAPORATION; STEAMBOAT; STEAM ENGINE; STEAM HAMMER; STEAM SHovel.

**STEAMBOAT.** The term *steamboat* is used for steam-driven vessels which sail on rivers, and also for the smaller ones on lakes or in the coastal waters of the sea. *Steamship* is used for large vessels such as those sailing on the open sea. John Fitch built the first workable steamboat in 1787. The first financially successful steamboat was Robert Fulton's *Clermont*. In 1807, it steamed the 150 miles up the Hudson from New York City to Albany in thirty-two hours. Before the vast development of the railroad systems of the United States, the steamboat was important in carrying passengers on the great rivers. On the Great Lakes, steamboats and steamships are used to carry most of the nation's iron ore and wheat, as well as coal, limestone, and other products. See also CLERMONT; FITCH, JOHN; FULTON, ROBERT; ROOSEVELT, NICHOLAS J.; SHIP (Invention of the Steamship).

A.L.M.

**STEAM ENGINE** is an engine which is operated by steam and makes use of steam's ability to expand. The steam engine played a major part in the change from muscular to mechanical power. It revolutionized methods of transportation, commerce, manufacture, and building construction.

The principle of the steam engine is simple. Energy is never lost. It may be changed from one kind of energy to another. Or it may remain *latent*, or not in use,

for countless ages. In either case, it can do work. Coal contains energy which has been stored for centuries. Man burns this coal to bring out its energy in the form of heat. Over the fire he places a boiler of water. The water absorbs the heat given up by the coal. When the water reaches its boiling point ( $212^{\circ}\text{F.}$  at atmospheric pressure), its molecules begin to move apart. They are changed into the form of a gas called *steam*. This steam takes up many times as much space as the water that it came from. Thus, the energy that was in the coal is now forcing steam to expand. In this form, the coal's energy will turn wheels for man.

### History of the Steam Engine

**Early History.** A hundred years before the Christian Era, a man named Hero lived in Alexandria, Egypt. Hero experimented with steam and described a device which was like a Barker's mill, but which used steam instead of water power. Hundreds of years passed before the science of steam engineering advanced. Then, in the first year of the 1600's, an Italian named Della Porta wrote a book which told how to build a fountain whose waters would bubble up from the pressure of steam. When the steam cooled, he said, it would condense and draw up more water from below.

We have said that steam takes up far more space than water. Suppose the steam were held in an airtight container, which was then cooled. The cooling would cause the steam to condense, or change back into water. In the form of water, it would no longer fill the container. A vacuum would be formed above the water. Since nature does not permit a vacuum to exist, something must rush in to fill that empty space. Della Porta's fountain worked on this principle. The vacuum that was caused by condensation of the steam would be filled by water rushing up from below.

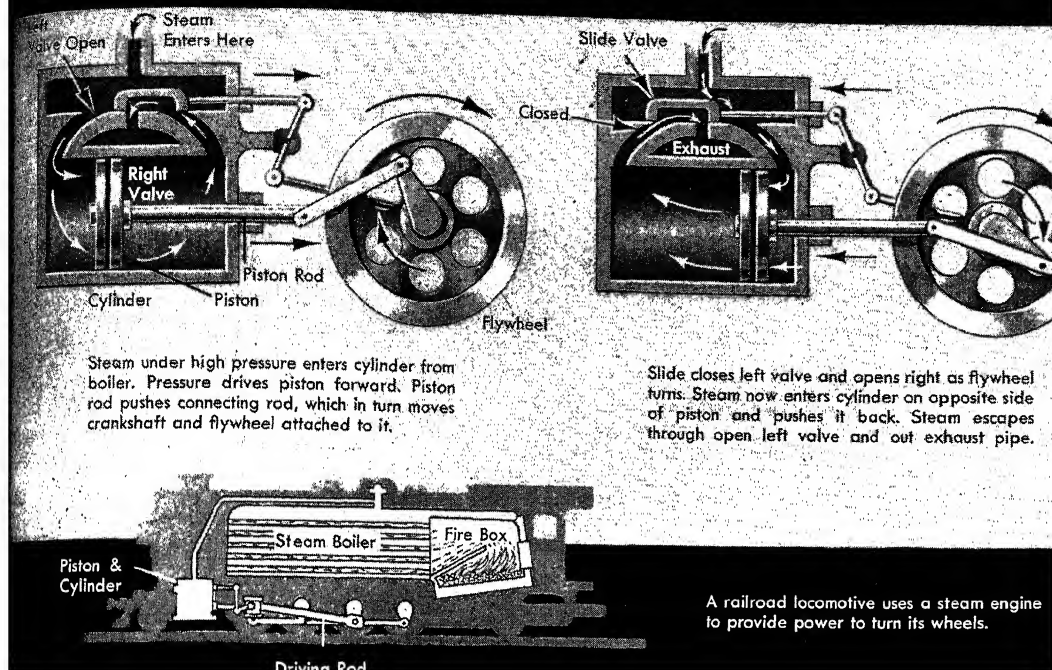
Until the 1800's inventors relied as much upon the power of steam to condense as upon its power to expand. The first practical engine was patented by Savery in England in 1698. It was a pump, only a bit more elaborate than Della Porta's fountain. When James Watt began his experiments in 1763, the Newcomen engine (1705) was the best known. But it, too, did not try to use the expansive power of steam. It had been invented by Thomas Newcomen, an English blacksmith. It was used in pumping water out of coal mines.

James Watt is believed by many persons to have invented the steam engine. Millions are familiar with the picture which shows him, an interested boy, watching the clouds of steam vapor rise from his kettle. But Watt was only the improver, not the inventor. What he did accomplish was to reduce the cost of operating a *condensing engine*, and to make it practical for uses other than pumping.

The Newcomen engine set Watt to thinking because it used an enormous quantity of steam, and therefore large amounts of fuel. A horizontal beam was hung in balance, like a seesaw. From one end of the beam hung the piston rod and from the other hung the weight to be lifted, usually water being pumped out of a well or from a mine. When one end of the beam went up, the other went down. At the lower end of the piston rod was a piston, fitted closely into a cylinder.



## HOW A STEAM ENGINE WORKS



Steam was let in below the cylinder. This pushed up the piston and one end of the beam. The end on which the weight was hung naturally was lowered. Cold water was then injected into the cylinder. This condensed the steam and left a partial vacuum beneath the piston. The top of the cylinder was open to the air. Thus, normal air pressure of nearly fifteen pounds to the square inch was always pressing on the piston. When the vacuum was created beneath it, the piston was forced down by air pressure. As the piston and its end of the beam went down, the weight on the other end of the beam was lifted into the air.

Watt saw that the alternate heating and cooling of the cylinder wasted much heat. In his engine the condenser and the cylinder were separate. Thus the cylinder always remained hot. This saved three fourths of the fuel cost for operating steam engines. Watt's engine was also made possible by more efficient methods of boring metal to prevent steam from escaping.

Watt took out his first patent in 1769, and we say the era of steam began on that date. He continued to make improvements on engines. Perhaps the most important was the use of the *double-action* principle. In this, steam is used first on one side of the piston, then on the other. He also learned to shut off the steam when the cylinder was only partly filled. The expansion of the steam already in the cylinder completed the piston's stroke. But Watt never experimented in the use of high-pressure steam. His own pressures were not much greater than air pressure, fifteen pounds to the square inch. Today pressures of over 1,000 pounds to the square inch are practical and often used.

### The Modern Engine

In the steam engine of today, the steam passes through the steam inlet into the steam chest to await use. From there it passes through the right-hand steam port to the cylinder chamber beyond the piston. As it expands, the steam pushes the piston toward the left end of the cylinder. The piston rod moves in the same direction and turns the wheel which is being driven half way around.

As the wheel turns, the eccentric and its rod move in the direction opposite that of the piston rod. This moves the sliding valve and closes off the steam port that was used for this first half of the piston stroke. The used steam passes out of the cylinder through the exhaust port.

Now steam enters through the steam port to the left. It passes to the left of the piston and pushes the piston toward the right. The piston rod moves in the same direction, and its connecting rod finishes one turn of the wheel. At the same time, the eccentric and its rod are moving toward the left, and the sliding valve is returning to the position in which we see it in the illustration. The used steam leaves the cylinder, and the engine is ready to start another stroke.

One of the many present-day improvements in the steam engine is the use of high pressures. Another is the *compound* engine. Here high-pressure steam does work in one cylinder, then passes to another, or even to a third and a fourth. A further improvement is in *super-heating* — raising the temperature of the steam to about 700° F. without increasing the pressure. This prevents the incoming steam from condensing on the engine cyl-

under surfaces. Superheated steam contains so much heat that it requires a longer cooling period for condensation.

Another radical improvement in steam engineering was the introduction of the turbine engine. In this the pressure is not used on a piston. Instead, it is used to move blades mounted on a revolving shaft or drum, much like a water wheel. The steam turbine's ability to drive electrical generators economically has given it almost universal use in power stations. It also provides an economical source of power for driving large steamships.

R.A.FE.

**Related Subjects.** The reader is also referred to:

Governor  
Industrial Revolution  
(Steam Engine)  
Locomotive

Ship  
Steam  
Turbine  
Watt, James

**STEAM FITTER.** See BUILDING TRADE (Vocational Opportunities); PLUMBING AND PIPE FITTING INDUSTRY OF THE UNITED STATES AND CANADA, UNITED ASSOCIATION OF JOURNEYMEN AND APPRENTICES OF THE.

**STEAM HAMMER.** The steam hammer is a power-driven hammer which is used to make heavy forgings. The hammer head is raised by the pressure of steam which is admitted into the lower part of the cylinder. When the hammer reaches the desired height, the steam is released and the hammer falls. Steam admitted into the upper part can be used to increase the speed of the fall. The speed with which the hammer is released also determines its force.

Steam hammers vary in weight from 100 pounds to 100 tons. They can be controlled so perfectly that a giant hammer head can descend with crushing force, or crack a nut without hanning the kernel.

*Steam drop hammers* are raised like ordinary steam hammers. But they differ from other steam hammers in that they fall by their own weight. The steam hammer was invented by the Scottish engineer and manufacturer James Nasmyth in 1839.

G.H.G.

See also NASMYTH, JAMES.

**STEAM HEATING.** See HEATING (Central Heating Systems).

**STEAMING.** See COOKING (Methods).

**STEAMSHIP.** See SHIP.

**STEAM SHOVEL.** The first use of a steam engine to operate a digging machine, or excavator, was by William S. Otis, of Massachusetts, who developed a crude steam shovel in 1838. This steam shovel was used to dig the roadbed for the Western Railroad in Massachusetts. Steam shovels were used to dig the Panama Canal, and for many other great engineering projects. Power shovels are now usually operated by electric motors or Diesel engines.

See also POWER SHOVEL.

**STEAM TURBINE.** See TURBINE.

**STEAPSIN,** *see* AP *sin*. See DIGESTION.

**STEARIC,** *see* AR *ick*, **ACID** (chemical formula,  $C_{17}H_{35}COOH$ ), is a fatty acid which may be formed from tallow and many other animal and vegetable fats. Stearic acid comes in white crystals. It is used commercially with paraffin in the manufacture of wax candles. It is also used in the making of stearate salts, which are found in varnish dryers, waterproofing materials, and

various other products. See also ACID; STEARIN. G.L.B.

**STEARIN,** *STE ah rin*, is a combination of stearic acid and glycerin. Chemically, stearin is an intricate compound of carbon, hydrogen, and oxygen. It is the chief ingredient of mutton and beef fat, and certain vegetable fats such as palm oil. When these substances are boiled, the stearin is crystallized into pearly, waxlike scales which have neither taste nor odor. Stearin is boiled with alkali to form soap. The stearic acid combines with the alkali, and the glycerin is separated as a by-product of the soapmaking. Stearin also yields an oil which is used in the manufacture of some margarine. See also GINGERIN; STEARIC ACID.

L.R.C.

**STEATITE,** *STE ah tite*. See SOAPSTONE.

**STEDMAN, EDMUND CLARENCE** (1833-1908), was an American poet, journalist, and critic. He also operated a prosperous brokerage business. He served as a war correspondent for the New York *World* during the War between the States. Some of his poems were inspired by the war. He also wrote a number of books on American literature.

**STEEL.** See ALLOY; IRON AND STEEL.

**STEELE, RICHARD, SIR** (1672-1729), was a British writer who created a new type of essay. In his hands the essay became the mirror of the manners of the day, and was read as eagerly as gossip columns are today.



Sir Richard Steele, one of the best known of English writers

Steele was born in Dublin, Ireland, and was educated at Charterhouse School and at Oxford University. At Charterhouse he became friendly with Joseph Addison, who later became his associate. (See also ADDISON, JOSEPH.) Steele left Oxford without a degree and joined the army. He left the army after he rose to the rank of captain, and began to write plays. He soon became a popular dramatist.

In 1707 he was appointed gazetteer, or recorder of the official journal, for the government. His work made him want to establish a magazine of his own which would be less formal, and in 1709 he founded the *Tatler*. Addison later began to write essays for this publication and the two men struck up a literary partnership. In 1711 they started the *Spectator*, and later the *Guardian*, and several other papers. In 1713 Steele entered politics and was elected to Parliament, where he held many posts. In 1722 he retired to the country.

G.E.B.

**STEELE, WILBUR DANIEL** (1886- ), is an American novelist and short-story writer. His short stories are noted for their clever structure. Four of his stories have won O. Henry Memorial awards. Steele was born in Greensboro, N.C., and was educated at the University of Denver. He studied art in Boston, Paris, and New York City. But after 1912 he devoted all of his time to writing.

L.J.

His Works include *Sound of Rowlocks*; *The Terrible Woman*; and *The Man Who Saw Through Heaven*.

**STEEL ENGRAVING.** See ENGRAVING.

**STEELHEAD.** See TROUT.

**STEELWORKERS OF AMERICA, UNITED**, is a labor union affiliated with the Congress of Industrial Organizations. It has about 850,000 members organized into 2,000 locals in North America. Members are employed in iron-ore mines, and iron, steel, tin, or aluminum manufacturing, processing, and fabricating. Anyone who has the power to hire and fire workers can not become a member.

The union was founded in 1936 as the Steel Workers Organization Committee. The Amalgamated Association of Iron, Steel and Tin Workers affiliated with the union in 1942, and the present name was adopted soon afterward. The union has headquarters in Pittsburgh, Pa., and publishes a monthly magazine called *Steel Labor*. D.J.McD.

**STEELYARD** is a mechanical device once commonly used for weighing groceries and other commodities. A crude early steelyard was used by traders in ancient Egypt and Rome. The steelyard is a lever of the first class (see LEVER). It consists of an iron bar with one

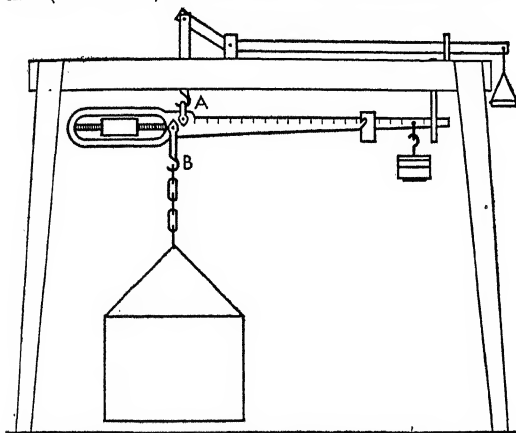


Diagram of a Modern Steelyard Scale

long arm and one short one. It hangs in balance from the hook A. The objects to be weighed are hung from hook B on the short arm. A movable counterweight is shifted outward on the scaled long arm until there is a balance. The number at which the weight rests indicates the weight of the goods hanging from the hook. See also WEIGHING SCALE. E.A.F.B.

**STEEN**, *steyn*, **JAN** (1626-1679), was a Dutch painter. He was noted for his wide range of subjects and his ability to portray dramatically gay and humorous scenes of everyday life. At times he put a touch of satire in his work, but usually he painted with sympathy. His best pictures are noted for their clear coloring and careful structure.

Steen was born in Leyden and was educated at Leyden University. He became a member of the painters' guild of that town in 1648. Later he lived in The Hague, Delft, Warmond, and Haarlem, but he returned to Leyden to spend the last ten years of his life. W.S.T.

**His Works** include "Eve of Saint Nicholas"; "The Rustic Wedding"; and "The Music Master."

**STEENBOCK, HARRY** (1886- ), is an American

student of the chemistry of human and animal bodies. He is particularly known for his studies of foods. He patented a process for irradiating food to increase its vitamin-D content. In 1920 he became a professor at the University of Wisconsin.

**STEENBOK**, *STEEN bahk*, or **STEINBOK**. See STEINBOK.

**STEEPLEBUSH**. See FLOWER (color plate, Prairie Flowers); SPIRAEA.

**STEER**. See COW; FARMING AND FARM LIFE (color plate, State Fair).

**STEERING GEAR**. See AUTOMOBILE (Parts).

**STEFANI** is the leading news agency of Italy. The official name is *Agenzia Stefani*. The organization was founded in Turin in 1854 by Guglielmo Stefano. Stefani became the official government news agency under the monarchy and under Mussolini's Fascist regime. It was one of the principal means by which the government controlled news printed in Italian newspapers. E.S.W.

**STEFANSSON**, *STA fahns sohn*, **VILHJALMUR** (1879- ), is an arctic explorer and writer. He is well known for his many books favoring the colonization of the Arctic. Stefansson taught that the arctic region is the new frontier, rich in natural resources, warm and "friendly" to settlers. His book, *The Friendly Arctic*, which tells how to live comfortably in the Arctic, has been called the greatest handbook on polar travel ever written.

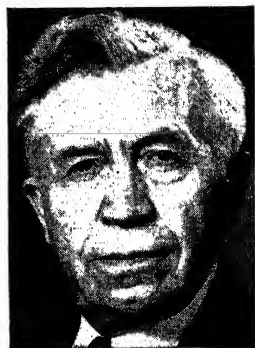
Stefansson was born in Manitoba, Canada, of Icelandic parents. He grew up in North Dakota and attended the University of North Dakota, the University of Iowa, and Harvard University.

In 1905 he became a member of an archaeological expedition in Iceland. An article he had written about this expedition attracted the attention of some arctic explorers and they invited him to join them. He made several expeditions afterward, and in 1913 the Canadian government sent him to explore the northern shores of Canada and Alaska. Stefansson's ship was caught in the ice and sank with a loss of eleven lives. But he resumed the journey by dog sled and surveyed large areas from Martin Point to Banks Island.

In 1915 Stefansson discovered the mountainous region to the north and west of Prince Patrick Island. During the next two years he explored unknown land west of Axel Heiberg Island. In 1924 he led an expedition into central Australia. In later years he lectured at universities in the United States and Europe. J.Cor.

**His Works** include *My Life With the Eskimo*; *Hunters of the Great North*; *Ultima Thule*; and *Unsolved Mysteries of the Arctic*.

**STEFFENS, LINCOLN** (1866-1936), was a writer, lecturer, editor, and journalist-reformer. He was known



Macmillan

**Vilhjalmur Stefansson**, Canadian explorer who urged people to settle the Arctic

as a "muckraker" because he exposed dishonesty on the part of public officials and corporations in many cities.

Steffens was born in San Francisco, and was educated at the University of California and in Heidelberg, Leipzig, and Paris. He worked for the New York *Commercial Advertiser* and later for *McClure's*, *The American*, and *Everybody's* magazines. His *Autobiography* ranks among the greatest written by an American.

E.C.A.

**His Works** include *The Shame of the Cities*; *The Struggle For Self-Government*; *Upbuilders*; *The Least of These*; and *Lincoln Steffens Speaking*.



Brown Bros.

Lincoln Steffens, a writer, worked for social reforms.

**STEGOSAURUS**, *steg oh SAW rus*. See DINOSAUR.

**STEIG, WILLIAM**. See CARTOON (Leading Cartoonists).

**STEIN, stine, GERTRUDE** (1874-1946), was one of the most unusual of modern American writers. In many of her books she wrote in a style which to the average reader makes little or no sense. Such of her phrases as "a rose is a rose is a rose" were quoted as jokes, and some critics accused her of being a literary faker. But others found in her works human warmth and sympathy and a basic rhythm that sometimes is almost poetry.

She did not always write in her most extreme style. Her first book, *Three Lives*, was fairly clear in meaning, and her last, *Breusie and Willie*, set down the speech of the common American soldier of World War II with great accuracy. She liked to call herself the "grandmother of modern American literature." Her influence on Ernest Hemingway and Sherwood Anderson was admitted by both of these men, and many other writers reveal the effect of her ideas about writing.

Gertrude Stein was born in Allegheny, Pa., and studied at Radcliffe College. She was a favorite student of William James at Radcliffe, and excelled in psychology. Later she studied medicine for four years at John Hopkins University. In 1903 she went to Paris with her lifelong friend, Alice B. Toklas, and remained in France the rest of her life except for a visit to the United States in 1934. In Paris she became a leading figure among the modern artists and writers. S.M.S.

**Her Works** include *Ten Portraits*; *Matisse*; *Picasso and Gertrude Stein*; *The Autobiography of Alice B. Toklas*; the words to the opera *Four Saints in Three Acts*; *Everybody's Autobiography*; *Paris France*; and *Ida*.

**STEINBECK, JOHNERNST** (1902- ), is an American novelist. His works range from historical fiction to brutally realistic novels, but his characters are al-



Viktor Press

John Steinbeck stirred America with his novel, *Grapes of Wrath*.

most always the poor and downtrodden of the earth. His novel about dispossessed farmers, *Grapes of Wrath*, was called the "twentieth century *Uncle Tom's Cabin*." It won the Pulitzer prize for fiction in 1940. Steinbeck was born in Salinas, Calif., and studied at Stanford University. He worked for a time as a reporter, and afterwards supported himself with odd jobs. His first novels gained him the attention of critics, but little fame. But in 1937 his sixth novel, *Of Mice and Men*, became a best seller.

L.J.

**His Works** include *In Dubious Battle*; *Tortilla Flat*; *Cannery Row*; *The Moon Is Down*; and *The Wayward Bus*.

**STEINBOK, STINE** *bahk*, or **STEENBOK**, is a small antelope that lives in southern and east-central Africa. Its name is taken from the Dutch and means *stone buck*. The steinbok's coat is reddish or pale brownish above. The under parts are almost white. The animals are about 22 inches tall. Both sexes have straight slender horns that are seldom more than 4 or 5 inches in length. Steinboks prefer to live in grassland, but they sometimes are found in open woodland. These antelope are often hunted with hounds. They have the habit of hiding flat on the ground until the last minute of danger before dashing away at very high speed.

V.H.C.

**Classification.** The steinbok belongs to the family *Bovidae*. Its scientific name is *Raphicerus campestris* and *R. sharpei*.

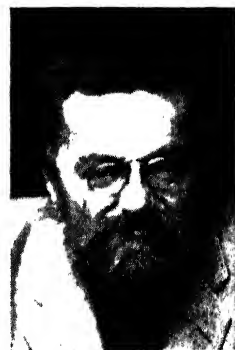
**STEINER, STI ner, EDWARD ALFRED** (1866- ), is a Congregational minister and sociologist. He came to the United States from his native Bohemia in 1891. Steiner became known as a lecturer and writer on immigrant problems. One of his best-known books is *From Alien to Citizen*.

**STEINMETZ, CHARLES PROTEUS** (1865-1923), was a famous electrical engineer. He is credited with more than a hundred electrical inventions, including magnetite are lamps, induction regulators, transformers, and measuring instruments. His most dramatic experiment was the creation of man-made lightning in order to learn how to protect electrical systems from damage by lightning.

Steinmetz, a dwarflike cripple, was born in Breslau, Germany. He was educated at the University of Breslau, where he was a brilliant student in mathematics and science. Steinmetz was a strong socialist, and while still a student he was forced to leave Germany because of an editorial he had written.

In Zurich, Switzerland, where he went to complete his studies, he became friendly with an American student who paid his passage to the United States. Steinmetz landed in New York City with only ten dollars and knowing no English, but he soon found work.

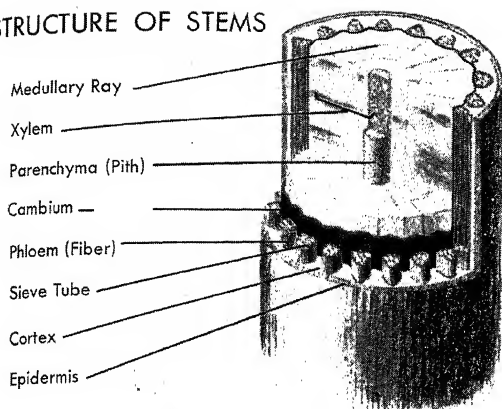
In 1893 he joined the engineering staff of the General Electric Corporation at Schenectady, N.Y. There he



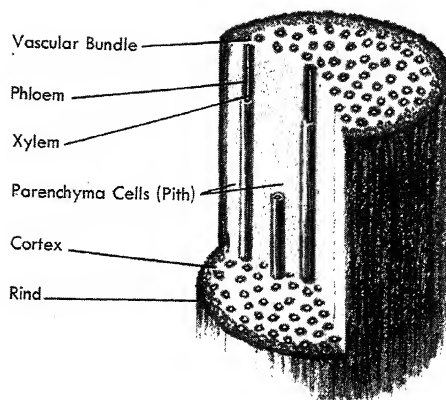
Brown, Bros.

Charles Steinmetz, called the "Wizard of Schenectady"

## STRUCTURE OF STEMS



DICOTYLEDONOUS PLANT



MONOCOTYLEDONOUS PLANT

carried on the experiments that brought him fame. After 1902 he served as professor of electrophysics at Union College. E.Y.

**STELLE.** See ARCHITECTURE (Terms).

**STELLA (ESTHER JOHNSON)** (1681-1728). See SWIFT, JONATHAN.

**STELLER'S SEA LION.** See SEAL (Seal Family [Eared Seals]).

**STELLITE, STEEL** *etc.* See ALLOY (Other Hard Alloys); COBALT.

**STEM.** The stem is the central part of a plant. It supports the leaves, flowers, and fruits. The largest stems are the immense trunks of the giant sequoia trees of California.

Most stems have special structures which make them semirigid frameworks. In annual herbs, the ordinary cells of the stem are usually filled with watery sap. This makes the stem stiff and rigid. When the stem loses its water, it wilts and is useless for support. All woody stems and the stems of some herbs have special supporting cells besides the ordinary cell walls of cellulose. These special cells are known as tracheids, bast fibers, and wood fibers.

The stem also furnishes channels for carrying sap between the roots and leaves. The roots absorb minerals and water from the soil, and the leaves manufacture food. Conducting cells and the supporting cells make up a great part of the stem. Sometimes the same cells carry on both functions. There are special cells that carry water and minerals, and others for dissolved food such as sugar and proteins. The cells that carry water are known as vessels and tracheids. They form the tissue called *xylem*. The food-conducting cells are known as sieve tubes, and form the *phloem* tissue.

Perennial plants have a third tissue, the *cambium*, between the xylem and phloem. The cambium produces new layers of the other two, usually each year.

**Cross Section of the Stem.** There are two common arrangements of xylem and phloem in the stem. One type is found in the monocot plants, such as corn, bamboo, and grass. These plants have no cambium. The xylem and phloem form bundles which are in the shape of strands running the length of the stem. The second arrangement is in the dicots, such as oaks, elms, roses, and fruit trees. If a young stem of one of these plants is cut across, it shows bundles of cells, like the spokes of a wheel. In each bundle, all the phloem is on the outside,

and the xylem inside. Older stems and trunks have a layer of phloem just inside the bark, and the rest of the stem is all xylem. The stem grows a new layer of xylem each year, thus forming the annual rings. The stems of full-grown dicots have an outer protective covering of bark, which contains cork layers, keeping the tree from losing water.

**Special Functions.** Beside supporting the plant and carrying sap, some stems manufacture food. Others store food, and still others help produce new plants. The green stems of some plants help manufacture food. In the case of perennial plants, this food manufacture stops when the bark grows thick and corky, thus shutting out the light. In any case, the stem grows a permanent new layer each year.

Leafless plants, like the cacti, have thick green stems that expose a broad surface to the light and air, and serve as leaves. The fleshy stem also holds water for the plant to use in time of drought. Many a thirsty traveler has drunk this reserve water to save his life. Some desert plants can store enough water to stand a drought lasting ten years or more.

**Underground Stems.** Some plants have underground stems. If these are long and slender they are called rootstocks. Examples are the stems of the May apple, Solomon's-seal, and mints. Other underground stems are the short thick bulbs of the hyacinth and lily, and the tuber of the white potato. Stems like these hold large reserves of food, and keep the plant alive when it cannot make new food. Some underground stems produce aerial stems. Others, such as the ferns, send up leaves, and the plant has no stem above ground.

**Reproduction by Stems.** Many plants reproduce from portions of the stem. The most troublesome weeds are those which can grow again from their underground stems or rootstocks. These stems are divided into sections by nodes. Even when they are cut to pieces, a new plant can grow from every node. The slender runners of the strawberry, the bulbs of the lily, and tubers of the potato also produce new plants. An ordinary branch of the black raspberry will take root and form a new bush. Many plants can be grown from stems that are broken off and planted. Such stems are called cuttings, or slips. Plants that will grow this way include the snap willow, grapevine, currant, and many house plants.

**Life and Growth.** In some plants the stem lives a single year, in others it lives two years, and in still others



it lives indefinitely. Certain annual plants do not really die from the cold weather as many persons think. They naturally stop growing after they have borne fruit. These plants then die even in places where there is no cold weather.

Different stems also have different rates of growth. The stalks of the sunflower and the giant ragweed grow ten or twelve feet in a season. Slender climbing stems often grow forty feet in a single summer. But many trees grow only one to three inches in height a year. Trees in dense forests which must reach up for light and air grow tall and have no branches for a great height. When they grow alone, they are low and have broad tops.

**Uses of Stems.** Man and the animals get much of their food from plant stems. Sugar, molasses, and sirup come from the sap in the stems of the sugar cane and the maple tree. The edible parts of potatoes and onions are underground stems. Asparagus, celery, and other vegetables are aerial shoots. Corn sirup is made from cornstalks, which are also an important food for horses and cattle. The fleshy stems of the thornless prickly-pear cactus are another valuable cattle food. Many wild animals, such as deer and rabbits, browse on twigs and stems. Common starch is often made from the potato, and sago is made from the starchy pith of the palm trunk. Perhaps most important of all is the use of woody stems as a building material. C.J.H.

**Related Subjects.** The reader is also referred to:

Bark	Phloem
Bulb	Plant (Stems)
Cambium	Root
Grafting	Sap
Leaf (Petiole)	Tuber

**STEM AND STERN.** See BOATS AND BOATING (Boat-building).

**STENCIL,** *STEN sil*, is a thin sheet of metal or other material, with lines and dots cut in it for the purpose of reproducing designs or letters. The stencil is placed on the surface of the material to be decorated or lettered. A brush or sponge is then wet with ink or paint and passed over the stencil. The stencil process serves as a quick method of marking packing boxes. It is also widely used to decorate curtains, bedspreads, furniture, and other household articles, as well as clothes and uniforms. Stencil designs are also often used on walls and ceilings, and for various signs. Schools often teach stenciling as part of the course in applied arts classes. See also MIMEOGRAPH. W.M.M.

**STENOGRAPHY,** another name for SHORTHAND. See SHORTHAND.

**STENOTYPE.** The stenotype is a machine used to take down dictation or speech rapidly and accurately. It has a keyboard of twenty-three keys, so spaced that any number of the letters may be struck at one time. Numbers are written by striking the numeral bar and the key bearing the desired number. The numeral bar acts as a shift. The letters are those of the English alphabet, arranged so that the fingers of the left hand print the beginning consonants of a word, the right hand the concluding consonants, and the thumbs the vowels. Several letters of the alphabet have been left out, to simplify operation. These letters are supplied by combinations which may be printed by a single stroke. Thus, a begin-



**The Light, Compact Stenotype Machine** uses simplified spelling in taking dictation swiftly and accurately. Stenotype Co.

ning consonant *B* is represented by striking simultaneously the two letters *PH*.

A system of simplified spelling is used. All silent letters are dropped, and words most frequently used are often written with a single letter or in abbreviated form. The notes are printed on a narrow tape of paper which progresses automatically, a line with each stroke, and each symbol always occupies the same position in the line. The notes have the advantage of being easily transcribed by anyone familiar with stenotypy. The simple sentence, "She was at our house," would appear:

S H I  
W A S  
A T  
O U R  
H O U S E

Most words may be written with a single stroke, and many phrases require only one stroke. A stenographer and court reporter, W. S. Ireland, invented the machine. See also SHORTHAND. W.B.

**STEPHEN,** *STER en* (about 1097-1154), was an English king whose reign was one of the darkest and weakest in English history. He was the third son of Stephen, Count of Blois, and Adela, daughter of William the Conqueror. Stephen promised his uncle, Henry I of England, that he would help Henry's daughter Matilda gain the throne when Henry died. In return for this pledge Henry gave Stephen large estates in Normandy.

When Henry died in 1135, Stephen left Normandy and claimed the throne on the grounds that he had been forced to agree to help Matilda. Stephen was crowned king in Westminster Abbey, but four years later Matilda and her half brother the Earl of Gloucester landed in England and claimed the throne. A civil war broke out.

Stephen held the throne until his death, in spite of several defeats in battle. But in 1153 he agreed to have Matilda's son Henry of Anjou follow him on the throne. Matilda's son was crowned Henry II, the first king of the Plantagenet line. P.V.B.J.

**STEPHEN, GEORGE** (1829-1921), BARON MOUNT STEPHEN, was a Canadian financier. He was one of the founders as well as first president of the Canadian Pacific Railway. Stephen was born at Dufftown, in Banff-

shire, Scotland, where he received a grammar-school education. In 1850 he went to Canada and became a cloth manufacturer in Montreal. In 1873 he was appointed president of the Bank of Montreal. Afterward Stephen joined the syndicate which controlled the Saint Paul and Manitoba Railway. In 1880 he became a leading member of the company that built the Canadian Pacific Railway. Eight years later he moved to England.

H.U.F.

**STEPHEN, SAINT**, was the first Christian martyr. He was stoned to death outside Jerusalem some time after the Crucifixion (Acts 7:58).

Stephen was one of the seven church officers, or deacons, appointed by the Apostles. Their duty was to look after the poor. He was a very religious man, and was known for the miracles he performed and for his preaching. The Jewish high priests accused him of teaching disobedience to the customs and rules associated with the law of Moses. He was brought to trial before the high council of the Sanhedrin. Here he made a great speech in his own defense (Acts 7). He said he was not speaking against the "Temple and the Law," but that those who attacked him were failing to obey the Law themselves. The mob became so furious that they attacked him. One witness to his death was Saint Paul, who had not yet been converted to Christianity (Acts 8:1). Saint Stephen's Day is December 26 in both the Roman Catholic Church and the Church of England.

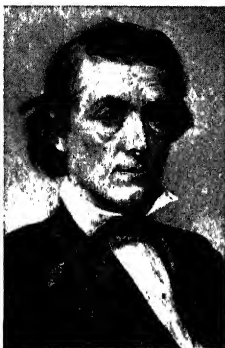
F.C.G.

**STEPHEN F. AUSTIN STATE TEACHERS COLLEGE** is a state-supported school for men and women at Nacogdoches, Texas. In addition to the professional course for teachers, courses leading to bachelors' degrees are available to students who desire a liberal education or specialized training for scientific and business careers. Strong preprofessional courses are also offered for those who wish to enter the professions of medicine, law, or engineering. The college was founded in 1923. Average enrollment is about 800.

T.E.F.

**STEPHENS, ALEXANDER HAMILTON** (1812-1883), was Vice-President of the Confederate States of America during the War between the States. He was born near Crawfordsville, Ga., and was educated at the University of Georgia. He had originally intended to become a minister, but he changed his mind and took up the study of law instead. In 1834 Stephens was admitted to the bar, and two years later became a member of the state legislature. From 1843 to 1859 he was a Representative in Congress from Georgia.

Stephens was opposed to secession, but he remained loyal to Georgia when the state left the Union in 1861. He was elected delegate to the Montgomery Convention which created the provisional or temporary government for the Confederacy. Stephens was chosen Vice-



Brown Bros.

**Alexander H. Stephens,**  
Vice-President of the Con-  
federate States of America

President of the new government, although he often disagreed with President Jefferson Davis on questions of states' rights.

In February, 1865, Stephens led the unsuccessful peace commission which met with President Abraham Lincoln at Hampton Roads. (See HAMPTON ROADS CONFERENCE.) After the war he was arrested and imprisoned for six months at Fort Warren, in Boston Harbor. In 1866 he was elected to the Senate, but was not allowed to serve. Stephens then devoted his time to writing *A Constitutional View of the Late War Between the States*. Later he wrote other books and also served as editor of the *Atlanta Southern Sun*.

In 1872 he was again elected Congressman from Georgia, and ten years later was elected governor of his state. Stephens died a few months after taking office.

W.B.H.

See also STATUARY HALL.

**STEPHENS, JAMES** (1882- ), is an Irish poet, novelist, and short-story writer. His work is sometimes humorous and playful and sometimes serious, but it is always imaginative and unusual. *The Crock of Gold*, a fantastic novel, is probably his best-known book. It was first published in 1912, and established Stephens' reputation. Stephens' interest in Irish folklore is apparent in much of his work, such as his *Irish Fairy Tales*, a book for young people.

He was born in Dublin, and grew up in poverty. The poet George Russell admired Stephens' writings and helped him to become known.

E.L.C.

His *Works* include the books of verse *The Hill of Vision*, *Strict Joy*, and *Kings and the Moon*; and the fictional writings *Here Are Ladies*, *Deirdre*, *In the Land of Youth*, and *Eched in Moonlight*.

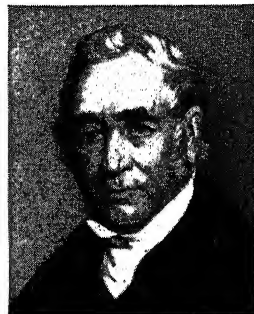
**STEPHENS COLLEGE**, in Columbia, Mo., is one of the largest junior colleges for women in the United States. It is controlled by the Baptist Church but admits students of all faiths. Courses are given in ten divisions — communications, humanities, social studies, sciences, philosophy and religion, home and family, health education, languages, vocations, aviation, and extraclass activities. The school was first founded as the Columbia Female Academy in 1833 and became a junior college in 1856. Average enrollment is about 2,000.

J.M.W.

**STEPHENSON, GEORGE**, and **ROBERT**, were British engineers, father and son. Their inventions helped to create the British railway system.

**George Stephenson** (1781-1848) was called "the founder of railways." He was born the son of a poor Scottish miner in Wylam, near Newcastle. At the age of eight he began to work as a herdboy. In his spare time he made little models of engines of clay and sticks. These models later helped him work out some of his great projects.

When Stephenson grew older he went to work in the mines. He had little education, but by the time he was



Brown Bros.

**George Stephenson,** Brit-  
ish pioneer in the development  
of railroads

eighteen he could read and write. Stephenson's skill in repairing the locomotives used to haul coal out of the mines earned him the title of "Engine Doctor," and he finally decided to build an engine of his own. His second engine, *Puffing Billy*, embodied his invention, the steam blast. This was a device which increased the draft in the boiler. In turn the fire became hotter and made steam of a higher pressure. The engine was so successful that for years it pulled heavy loads of coal from the mines to Newcastle.

Stephenson invented many useful things besides engines. These included a miner's lamp, a fisherman's lamp, and an alarm clock. He became well known after building the Stockton and Darlington Railway between 1821 and 1825. He was at once engaged to build the difficult Liverpool and Manchester Railway, in which he used his original ideas for tunnels, grading, and bridges to make a level roadbed. Stephenson's locomotive, the *Rocket*, traveled at the then unheard-of speed of thirty miles an hour. It served as a model for future steam locomotives.

Stephenson was consulted on major railway projects in many countries and spread his original ideas of safety and passenger comfort. He became wealthy from his inventions and from his locomotive factory, and turned to philanthropy. His night schools for miners, libraries, music clubs, recreation rooms, and schools for miners' children were as original in his day as were his inventions.

**Robert Stephenson** (1803-1859) was born near the coal mines at Willington Quay, where his father worked as engineer. The boy's mother died when he was very young, and his father sent him to school in Newcastle. The boy began this unusual partnership by teaching his father in the evenings. Afterward the young man studied at the University of Edinburgh and went to South America as a mining engineer.

In 1827 he returned and helped his father build the *Rocket*. Afterward he became chief engineer for the construction of the first railway to enter London, known then as the London and Birmingham Railway. But Stephenson was chiefly noted for the great bridges and viaducts he built. He invented the tubular bridge, and also introduced the use of tubular girders in the construction of iron bridges. Stephenson built railways in Germany, Switzerland, and many other parts of Europe, and in Canada, Egypt, and India. Later he became interested in politics and was elected to Parliament, J.C.M.

See also *LOCOMOTIVE* (History and Development of Locomotives); *RAILROAD* (Railroads in Other Countries [England]).

**STEPPE**, *step*, is the Russian word for plain. The steppes of the Soviet Union stretch throughout the Ukraine, eastward to the Caspian Sea, and to the Altai Mountains in central Asia. These are great stretches of level grassy land with few trees. Cattle, sheep, and horses are grazed on the Asiatic steppes in spring, but are led to other pastures during summer, when dry weather usually scorches the steppe grass. The Great Plains of North America are much like the Russian steppes. E.J.L.H.

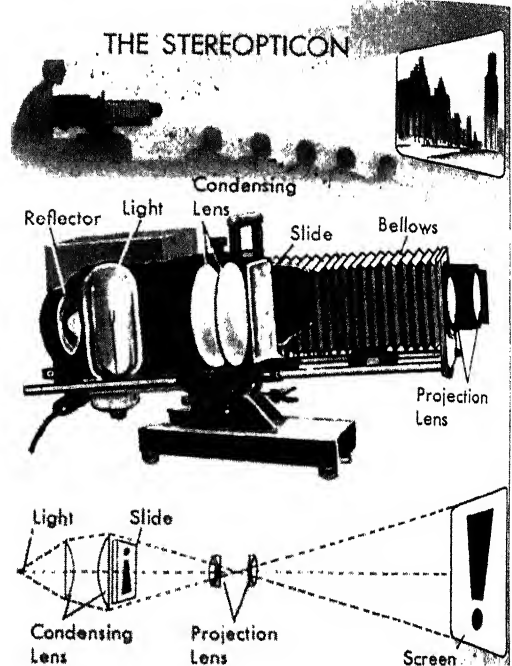
**STERE**, *stee*. See *METRIC SYSTEM* (Table).

**STEREOPTICON**, *STER ee AHIP tih kahn*. The stereopticon is an optical device for throwing pictures on a screen. In its simplest form, it consists of a source of light; a film or slide bearing the picture to be projected, which is put in the stereopticon upside down; a lens for focusing the picture on the screen; and a reflector for concentrating the light on the picture.

A toy magic lantern which uses lantern slides is one form of a stereopticon, a motion-picture projector is

another, and there are many other types. A home projector for candid camera films is a familiar kind of stereopticon. Here the light is a small but powerful electric light, the picture is a transparent photograph, often in color, and the lens is generally double. The lenses in front of the picture enlarge it on the screen. The lenses also reverse the picture, which is why the picture is put in upside down. The condenser is a concave mirror behind the light filament. There is a thick plano-convex lens, with one flat and one rounded side, between the light and the film.

Larger stereopticons are generally used in schools.



Q  
Item gathers light and directs through slide. Because of its construction, lens turns picture upside down

Light rays from slide are projected onto screen by projection lenses. These lenses reverse picture so it is again right side up.

Here the light source may be a carbon arc. The pictures are on glass slides of a standard size,  $3\frac{1}{2} \times 4$  inches. There are two plano-convex lenses between the light and the glass slide. Usually there are four projector lenses. There may also be a shutter to cut off the light while the slides are being changed. In other cases, one picture may tend to merge into another. This is called a dissolving view.

Many teachers make their own slides, which may be from photographs they have themselves taken. Inexpensive cameras sometimes produce excellent stereopticon slides. Or the teacher may draw his own slides, writing on clean glass with colored draftsman's ink.

A combination of stereopticon and phonograph is a popular way of teaching difficult subjects, such as

mathematics. The student can see the pictures and hear the lecture over and over, if need be, until he learns the lesson.

E.L.S.W.

**STEREOSCOPE**, *STER ee oh SKOHF*. The stereoscope is an optical device that makes photographs seem to have three dimensions. An ordinary camera sees things only in a flat plane, and never in the round. But if two cameras, set several inches apart, photograph the same object at the same time, and if these two photographs are then mounted side by side and viewed through a combination of lenses and prisms in such a manner that the two views enter the two eyes without strain, the resulting mental image picture appears to have three dimensions. Everything is seen in the round, the way our two eyes normally view things.

A stereoscope with a cabinet of pictures was once found in nearly every parlor, and even today it is popular, especially in schools and libraries. The old-time parlor stereoscope consisted of a rack with a handle, a slide for holding a double photograph, and a pair of screened lens-prisms to look through. The modern stereoscope is a little bakelite box with two viewing holes, and a knob for unwinding movie-type film on spools to be viewed.

Modern stereoscopes are extensively employed in aerial surveys. When taking aerial survey pictures the camera plane flies along at as near a constant speed and at as constant a height as possible. The camera is pointed straight down and the shutter snaps at a steady rate. The film is then developed and printed. Now, if any two consecutive pictures are viewed through a stereoscope, the elevations of the land come out with startling clarity, and the heights of even small stones on the ground can be clearly seen.

Another form of stereoscope is used in astronomy for finding small planets. When two photographs of a region of the sky are taken a few hours apart and viewed through a stereoscope, any planet that may be there will seem to fairly leap out from the background of stars. It is possible to mount two stereo photographs side by side, and view them with the two eyes converging, without prisms. The effect is a good picture in the round, but the eyestrain from such a picture is considerable.

Efforts have been made to take stereoscopic movies. These movies in green and red, when viewed through bits of cellophane in the same colors, give a startling effect of depth. They make locomotives seem to rush out into the audience.

E.L.S.W.

See also **Eye** (Stereoscopic Vision).

**STEREOTYPING** is the method of making type-metal plates for use in printing. In the process, type is first set and locked into a steel frame (chase). The face of the type is brushed over with a thin coating of oil. A prepared sheet of thick, composite paper, called *flog*, is laid on the type and beaten or pressed tightly against the type. This sheet takes a perfect impression of the face of the type or cut (picture) in the frame. The paper mold thus formed is then placed in an oven and baked until it becomes hard and dry. This mold, which is known as a *matrix*, or *mat*, is placed in a box face up. Melted type metal, made up mostly of lead, is poured over it. This hardens at once, forming a solid plate of type metal, and from this the page is printed. Plaster of

Paris or clay were formerly used for the matrix, but now composite paper is in general use.

Introduction of the stereotype process was an important factor in the speeding up of newspaper printing. The stereotype plates which are used on small presses are flat. Those used on rotary presses for newspapers are in the form of half cylinders. It takes only about fifteen minutes to make stereotype plates, and they are quite inexpensive. A number of plates can be made from the same matrix. Country newspapers get some of their subject matter from plants in the cities which specialize in making plates and "mats." "Boilerplate" is the slang term for this material. Stereotyping is now used only for the printing of newspapers and the cheapest books. Magazines and the better books are printed from electrotypes. See also **ELECTROTYPING**; **TYPE**. C.P.ROL.

**STERILITY**, *steh RIL ih tih*, is the inability to produce offspring. The word *sterile* is used in many ways to mean *barren* or *unfruitful*. A plant which has no pistil, or whose anthers bear no pollen, is a sterile plant, because it cannot produce seeds. Similarly, a male animal that cannot produce sperm cells, or a female animal that cannot produce ova (eggs) is sterile.

Sterility in human beings is brought about by any of a number of causes. A male may be sterile because his reproductive organs are not well developed or are diseased. In the female, sterility may be caused by such diseases as tuberculosis, syphilis, and gonorrhea, or by defects in the structure of the reproductive organs.

In many cases medical treatment will cure human sterility. A surgical operation may correct a poorly formed organ.

**Another Use of the Word** means inability to produce organisms. An inanimate object on which there are no bacteria or other living organisms is said to be sterile. See also **STERILIZATION**. P.R.C.

**STERILIZATION**, *STER ih lih ZÄ shun*, in medicine and bacteriology, means the killing of bacteria. Germ killing is valuable in preventing infection and the spread of disease. All doctors' and dentists' tools are sterilized before they touch the human body. The bandages we buy, as well as many of the medicines, are sterilized before they are packed. Sterilization has been practiced only since the late 1800's. An English surgeon, Joseph Lister, decided that much infection was caused by germs. Later he introduced antiseptic, germ-killing methods into surgery.

Proper sterilization is done by fire, steam, heated air, or certain chemicals. Steam and heated air are the best, for they leave no foreign matter on the sterilized object. Fire is commonly used in the home to sterilize a needle with which to prick a blister or remove a splinter. Steam cabinets are often used to sterilize instruments in hospitals and doctors' and dentists' offices. Heated dry air is used to sterilize oily medicines.

Pasteurization is a method of partial sterilization. Milk and other products are heated just enough to kill the harmful bacteria without damaging the product itself.

**Another Meaning** of the term is the operation by which it is made impossible for a man or woman to have children. In many states, laws allow state mental hospitals to sterilize patients who are incurable but who are

being freed from the institution. A hereditarily feeble-minded person should not have children, because they also might inherit feeble-mindedness. G.L.B.U.

See also DISINFECTANT; GERMICIDAL LAMP; PASTEURIZATION; STERILITY.

**STERLET, STUR** *let*. See STURGEON.

**STERLING SILVER**. See SILVER (Uses of Silver).

**STERN AND STEM**. See BOATS AND BOATING (Boat-building).

**STERNE, sturn, LAURENCE** (1713-1768), was a British author who played an important part in the development of the novel. He is considered one of the most original writers in English literature. His great work, *Tristram Shandy*, is full of a coarse and startling humor and is written in an easy, rambling style. But Sterne is most noted for his ability to create characters. Some of his creations, such as Uncle Toby, Corporal Trim, and Dr. Slop, will live as long as English literature is read.



Laurence Sterne, English writer of genial stories

Sterne, the son of a British army officer, was born at Clonmel, Ireland. The boy's early years were spent in traveling from place to place with his father's regiment. In 1736 Sterne was graduated from Cambridge University, and two years later became a minister in Yorkshire. There for twenty years he performed the duties of a country clergyman, but he lived in a strange manner for a minister. Sterne was friendly with the local wits and was noted throughout his parish for his rough wit and practical jokes.

After he published the first two volumes of *Tristram Shandy* in 1759, his fame as a humorist spread throughout the country. Sterne went to London and there became the talk of London society. He intended to write two volumes of *Tristram Shandy* every year as long as he lived, but he was able to write only seven more. In 1765 he made a journey in Europe and wrote *A Sentimental Journey through France and Italy*. Sterne died penniless in London a month after the book was published. r.j.

**STEROPE, S'TEHR** *oh pee*. See PLEIADES.

**STETHOSCOPE**. Physicians use this device to hear the sounds produced by certain organs of the body, such as the heart, lungs, intestines, veins, and arteries. The stethoscope picks up the sound, or beat, of these organs and makes them louder. The physician listens to the sounds to determine whether or not they are regular. If the sound of an organ is irregular, it may be a sign of certain diseases.

The stethoscope consists of a body contact piece, which is placed against the chest of the patient, and an earpiece, which is placed in the ear of the physician. A hollow tube connects the body contact piece to the earpiece. The most commonly used stethoscope is the diaphragm type, which has two earpieces. The body contact piece is bell-shaped and contains a thin diaphragm. The earpieces are joined to the chest piece by two rubber tubes.

The stethoscope was invented in 1816 by René Laënnec, a French physician. In 1819 Laënnec published the first description and diagnosis of various heart sounds. See also LAENNEC, RENÉ T.

**STETSON, JOHN BATTERSON** (1830-1906), was an American hat manufacturer. He became famous by making the ten-gallon hat which was popular with the cowboys in the West. Stetson, the son of a hat manufacturer, was born in Orange, N.J. The boy received little schooling. Instead, he was apprenticed in the family hat trade. In 1865 he opened a one-man hat factory in Philadelphia. Stetson created his own styles and was soon a wealthy man. In 1888 he endowed an academy in DeLand, Fla. Its name was changed to John B. Stetson University. See also JOHN B. STETSON UNIVERSITY. H.U.F.

**STETTIN, stich TEEN** (population 268,915), is an important Baltic Sea port. It has for years been one of the largest shipbuilding and ship-repair centers of Germany. Stettin lies on both sides of the mouth of the Oder River, eighty-three miles northeast of Berlin. Following the end of World War II, the representatives of the United Nations discussed at some length the question of the control of Stettin and the surrounding area.

#### STETTINIUS

**MR. EDWARD RILEY, JR.** (1900- ), was active in the foreign affairs of the United States during and after World War II. He was born in Chicago, and studied at the University of Virginia. In 1926 he began working with the General Motors Corporation, and was named vice-president in 1931. In 1934 he became an official of the United States Steel Corporation.

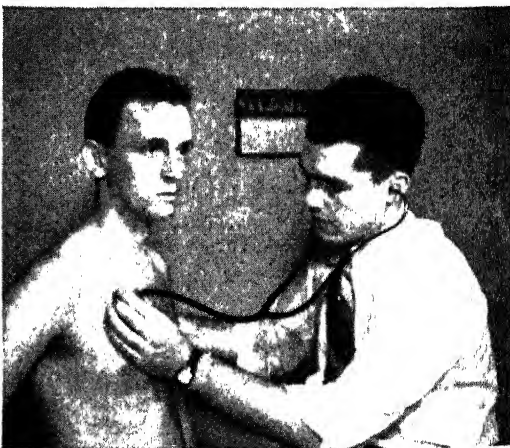
In 1940 Stettinius entered the national service,

and from 1941 to 1943 he was a special assistant to Pres-



EDWARD, JR.

Edward Stettinius, American statesman who helped to organize the United Nations



Purdue University

A Physician Listens to the action of heart and lungs with a stethoscope, as part of a patient's physical examination.



dent Franklin D. Roosevelt. In 1943 he was named Under Secretary of State and a year later followed Cordell Hull as Secretary of State. In this position he led the American delegation to the San Francisco meeting in April, 1945, which resulted in the organization of the United Nations. Stettinius resigned as Secretary of State a few months later, and served until June, 1946, as United States delegate to the Security Council of the United Nations. He then became rector of the University of Virginia.

E.E.R.O.

**STEBUEN, STOO ben, FRIEDRICH WILHELM LUDOLF GERHARD AUGUSTIN, BARON VON** (1730-1794), was a German soldier who helped the colonists during the



Ayer Collection, Newberry Library

**Baron von Steuben Drilling Colonial Troops** during the American Revolutionary War. This German military expert turned farmers and merchants into crack fighting men.

Revolutionary War. Steuben was born in Magdeburg. He joined the Prussian army and fought in the Seven Years' War. In 1778 he sailed to America. General George Washington sent Steuben to Valley Forge to train the raw colonial troops. He was appointed instructor-general, and traveled about drilling new recruits. In 1780 Steuben was given a command and took part in the Battle of Yorktown. After the war he was given grants of land and a pension and spent the rest of his life near Utica, N.Y.

N.G.G.

**STEVENS, ALBERT W.** (1886- ). See **BALLOON** (Balloon Exploration of the Stratosphere).

**STEVENS, ALFRED.** See **SCULPTURE** (England).

**STEVENS, ISAAC I.** See **WASHINGTON** (Famous Men and Women).

**STEVENS, JOHN.** See **NEW JERSEY** (Famous Men and Women).

**STEVENS, THADDEUS** (1792-1868), was an American statesman. He was one of the leaders in Congress who favored harsh treatment for the defeated South after the War between the States.

Stevens was born at Danville, Vt., and was educated at Dartmouth College. For a time he taught school at York, Pa., but later he took up the study of law and began to practice in Gettysburg, Pa. From 1833 to 1841 he served in the state legislature, and in 1848 was elected to Congress. Here he became a strong opponent of the fugitive slave laws, the Kansas-Nebraska Bill, and all other measures favorable to Southern interests.

In 1853 Stevens quit Congress in disgust and became one of the founders of the Republican party. In 1858 he

was again elected to the House of Representatives, and became leader of the House. During the war he fought fiercely to free the Negro slaves and give them the right to vote. In 1868 he proposed the impeachment of President Andrew Johnson.

W.B.H.

**STEVENS DAM**, often called **MUD MOUNTAIN DAM**, is the highest rock-fill dam in the United States. It is a flood-control project on the White River about thirty miles east of Tacoma, Wash. The dam is 425 feet high, with a top length of 700 feet. It controls a volume of 171,000,000 cubic yards of water. Stevens Dam is a Federal project built under the direction of the United States Army Corps of Engineers. The dam was completed in 1942, and the entire project is estimated to have cost \$11,606,000. See also **DAM**.

**STEVENS INSTITUTE OF TECHNOLOGY** is a privately controlled engineering school for men in Hoboken, N.J. Courses lead to B.S., M.E., and M.S. degrees. Besides the fine special libraries, there are special research laboratories for the designing of ship and yacht hulls, for the dramatic use of power and light, and for the development of powder metallurgy. The school was founded by Edwin A. Stevens in 1870. Average enrollment is about 1,150.

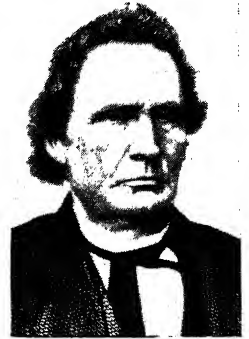
J.C.R.

**STEVENSON, ADLAI EWING** (1835-1914), was Vice-President of the United States from 1893 to 1897. He was a Representative in Congress from Illinois for two terms.

**STEVENSON, BURTON EGBERT** (1872- ), is an American writer and librarian. He is best known for the collections of verse and quotations which he edited. These include *Home Book of Verse*, *Home Book of Quotations*, and *Home Book of Shakespeare Quotations*. Stevenson was born at Chillicothe, Ohio, and studied at Princeton University. In 1899 he became librarian of the public library in Chillicothe. He also helped direct the army library system during World War I and in 1919 set up the American Library in Paris. He directed this library from 1926 to 1930.

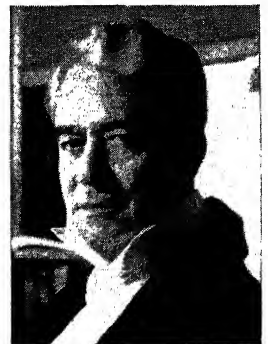
**His Works** include the mystery novels *The Marathon Mystery*, *The House Next Door*, and *The Red Carnation*.

**STEVENSON, ROBERT** (1772-1850), was a Scottish engineer. His greatest achievement was the building of the Bell Rock lighthouse, a feat that was believed to be almost impossible. Stevenson was the grandfather of the famous poet and novelist, Robert Louis Stevenson.



Brown Bros.

**Thaddeus Stevens** directed the impeachment trial of President Johnson.



Dodd Mead & Co.

**Burton Stevenson**, American compiler and editor of popular anthologies

Robert Stevenson was born in Glasgow, the stepson of a lighthouse engineer. The young man learned his profession from his stepfather and at the age of twenty-five was appointed a lighthouse engineer. Stevenson built twenty-three lighthouses along the coasts of Great Britain and invented the flashing light now used throughout the world.

J. Cor.

See also LIGHTHOUSE.

**STEVENSON, ROBERT LOUIS BALFOUR** (1850-1894), wrote some of the most popular poems, essays, and fiction of his time. He was one of the few writers to succeed



Brown Bros.

**Robert Louis Stevenson** wrote some of the best-loved stories and poems in English literature.

in making his works popular with both young and old. His *Treasure Island* helped introduce a period of romantic fiction into England and America. His *A Child's Garden of Verses* is familiar to almost all English-speaking children.

**Childhood.** Stevenson was born in Edinburgh, Scotland. His father was a prosperous civil engineer, and the boy showed much interest in that profession. But because of poor health, Stevenson studied law instead. He attended the University of Edinburgh and was admitted to the bar in

1875. But he was more interested in writing and in 1878 published *An Island Voyage*, which described a canoe trip through France and Belgium. Critics recognized the grace of the young writer's style, but the public paid little attention to the sketch. The following year, he published *Travels with a Donkey*, using his experiences in southern France as the background.

**Marriage.** In 1876, Stevenson met and fell in love with Mrs. Fanny Osbourne. Three years later he learned that she was ill in San Francisco, and he decided to come to see her. He had little money, so he traveled as a steerage passenger and crossed the country on an immigrant train. He made use of these experiences in *The Amateur Emigrant* and *Across the Plains*. After he arrived in San Francisco he married Mrs. Osbourne. He spent several months in a desolate mining camp, and then returned to Scotland, taking his wife and her son, Lloyd, with him.

**Search for Health.** The years following were wandering ones, spent in a long effort to find health. In 1888 he went with his family to Samoa, in the South Seas, where he remained until his death. He enjoyed superintending the construction of a home, which he called "Vailima" (after the name of Mount Vaea). The natives loved him, and he loved them. He took an active interest in councils, where he sat in a chair which means "teller of tales," and he wrote a book, *Myself and Vaea*, where he

essays between 1880 and 1888. These were *Virginibus Puerisque* and *Familiar Studies of Men and Books*. He also wrote a volume of fanciful and entertaining stories, the *New Arabian Nights*; the ever-popular *Treasure Island*; *Prince Otto*, a lively romance; *Dr. Jekyll and Mr. Hyde*; *Kidnapped*, an excellent and widely read story of Scottish life; and two collections of poems, *Underwoods* and *A Child's Garden of Verses*.

The most notable of his productions during the Samoan period were *The Master of Ballantrae*, another story of Scottish life; *David Balfour*, a sequel to *Kidnapped*; and the uncompleted romances, *St. Ives* and *Weir of Hermiston*.

**His Place in Literature.** Stevenson is one of the most fascinating personalities in the history of English literature, largely because of the courage which helped him to work diligently, uncomplainingly, and cheerfully, in the face of great difficulties. Those who knew him found it hard to judge the writer fairly because of his personal charm. But he ranks high because of his clear and careful style and his extraordinary power as a storyteller. He never forgot the importance of keeping up the steady



Robert Louis Stevenson's "Treasure Island" is one of the most popular adventure stories in English literature. Wallace Beery, as Long John Silver, and Jackie Cooper, as Jim Hawkins, helped make the tale into an exciting motion picture.

interest of his readers. He was a master of description, as well as of plot and dramatic incident, and he had an unusual ability to put life into whatever he presented, although the philosophy and character portrayal in his works is below the level of the other elements. L. U.

**STEWARDESS.** See AVIATION (Vocational Oppor-

**T, ALEXANDER TURNER** (1803-1876). See GRANT, ULYSSES SIMPSON (General).

**STEWART, WILLIAM MORRIS.** See NEVADA (Famous

**STEWART MOUNTAIN DAM.** See ARIZONA (Conservation).

**STEWING.** See COOKING (Methods).

**STHENO, *STHE* noh.** See MEDUSA.

**STIBNITE, *STIB* nite.** See ANTIMONY.

**STICK,** a term in printing. See PRINTING (Composition).

**STICK-BUTTON.** See BURDOCK.

**STICK INSECT.** See WALKING STICK.

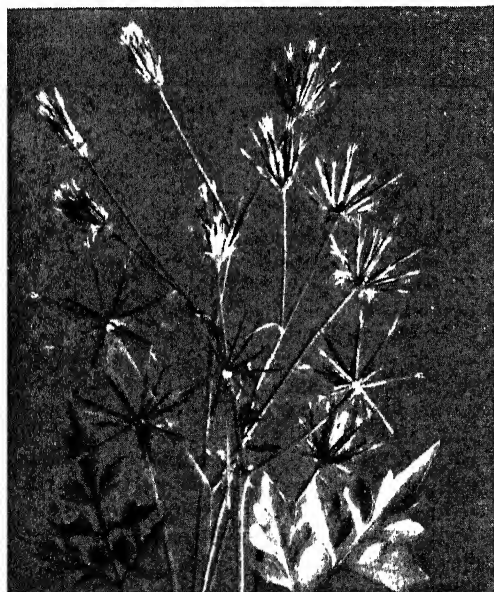
**STICK LEAF.** See FLOWER (color plate, Desert Flowers).

**STICKLEBACK, *STIK l BAK*,** is a name given to a family of small fishes of the Northern Hemisphere. They are called sticklebacks because some of their fins are made of strong, sharp, separated spines. Instead of having scales, the body is usually covered by hard plates or has no scales. There are both fresh-water and ocean sticklebacks. The fresh-water ones reach a length of from one to three inches. The ocean sticklebacks grow to be not more than seven inches long. The *brook stickleback* is common in the interior parts of Canada and in the Great Lakes states. These fish, like other sticklebacks, have the peculiar habit of building muff-shaped nests of sticks and roots for receiving the spawn. The male carefully guards the spawn. He also watches over the young for several days after the eggs are hatched. Sticklebacks are greedy eaters of the young of other fish. In aquariums they nip off the tips of the fins of other fish. See also FISH (Reproduction).

C.L.HV.

**Classification.** Sticklebacks make up about a dozen species of the family *Gasterosteidae*. The three-spined stickleback is *Gasterosteus aculeatus*. The brook stickleback is *Eucalia inconstans*.

**STICKSEED** is the name of a tall, hairy-stemmed weed that belongs to the borage family. It received its name because its fruit, a small, dry nutlet, has rows of sharp bristles that stick to the clothing of people and to the



The Fruit, or Nutlet, of Stickseed clings to clothing and the fur of animals by means of its sharp bristles.

fur and hair of animals. The plant grows in dry soil throughout North America, from the Mexican border northward. It has slender branches, gray-green leaves, and small blue, white, or lavender flowers. The stickseed is a stubborn weed, but it can be controlled by cultivation.

W.C.M.

**Classification.** The botanical name of the stickseed is *Lappula virginiana*. It belongs to the family *Boraginaceae*.

**STIEGEL, *STEE* gel, HENRY WILLIAM** (1729-1785), was an early American manufacturer. His "Stiegel glass" and his decorated ironware are now highly valued as collectors' items. Stiegel came to Philadelphia from his birthplace near Cologne, Germany, and opened an ironworks. There he produced the tin-plate stoves that were in general use for many years.

With a friend, Stiegel bought land in Pennsylvania, and laid out the town of Manheim. There, after 1764 he made the glass which some experts call the most beautiful ever blown. From simple, useful forms he went on to the use of rare colors, to the laying of color on color, and to the use of raised decorations. The Revolutionary War cost him his wealth and standing, and he died in poverty. He sometimes used the title of baron, but it is believed that it was not a legitimate title. M.C.C.

See also COLONIAL LIFE IN AMERICA (Glassware; illustration, Colonial Arts and Crafts); GLASS (Glassmaking in America).

**STIGMA,** in botany. See FLOWER (Pistil; illustration, Parts of a Flower); POLLEN AND POLLINATION (color plate).

**STIKINE, *stih* KEEN, RIVER.** This Canadian stream is the chief waterway from the Pacific Ocean into the interior of northern British Columbia. The Stikine flows into the Pacific Ocean through the narrow southern projection of Alaska, which shuts off a large part of British Columbia from the sea. The river begins on the west slope of the Cassiar Mountains in British Columbia. The course of the Stikine is a rough half circle running first northward, then westward, and finally curving gradually to the south. The river is about 335 miles long, and drains an area of about 20,000 square miles. In summer there is steamer service on the river as far as Telegraph Creek, about 170 miles from its mouth. The Stikine is the only river in British Columbia whose lower course is not high above sea level.

L.D., JR.

**STILETTO, *stih* LET oh.** See DAGGER.

**STILL.** See DISTILLATION.

**STILL, ANDREW TAYLOR** (1828-1917). See OSTEOPATHY.

**STILLWATER,** Minn. (population 7,013), was one of the earliest settlements in the state. It was established in 1839. For many years Stillwater was an important logging center for lumbering in the near-by pine forests. The city lies on the boundary between Minnesota and Wisconsin near the mouth of the St. Croix River, at a point where the river widens into a lake. Stillwater is the summer headquarters for a well-known art colony. A lumberjack festival is held every year. Stillwater has many wholesale and retail industries.

G.L.N.

**STILLWATER,** Okla. (population 10,097), depends on the rich surrounding farm lands for most of its trade and industries. Stillwater is about sixty-five miles northeast of Oklahoma City and about fifty miles southeast of

Enid. Oklahoma Agricultural and Mechanical College is in Stillwater. Lake Carl Blackwell, about five miles northwest of the city, is a popular vacation spot. Stillwater is the county seat of Payne County. E.E.D.

**STILT.** This wading bird has long, slender legs which give it the odd appearance of walking on stilts. The stilts are related to the avocets, and are found in both the Eastern and the Western hemispheres. The *black-necked stilt*, the only American stilt, is a handsomely marked bird about fifteen inches long. The upper part of its body is black, and the under part is white. Its long



S. A. Grimes

**The Stilt Has an Attractively Marked Body,** but the bird's curious long legs give it a strange, unbalanced appearance.

legs are a bright red. The stilt builds its nest by lining a low place in the ground with grasses. The female stilt lays three or four eggs of an olive or buff color, thickly spotted with chocolate tones. The bird lives along shallow ponds in fresh and salt marshes, and eats water insects and other tiny water animals. It is found in the western and southern United States and southward. See also AVOCET.

A.M.B.A.

**Classification.** The stilts belong to the family *Recurvirostridae*. The black-necked stilt is *Himantopus mexicanus*.

**STILT.** Stilts are poles with footrests attached at a certain distance above the ground. A person on stilts can stand, and can walk with long steps. Stilt walking has been an amusement for people in all periods of history, and it has sometimes filled a practical purpose. The city of Namur, Belgium, has been famous for its stilt walkers for many hundreds of years. The sport developed out of necessity in early days when the Sambre and the Meuse rivers overflowed to flood the city. There is a legend that in the 1600's the Archduke Albert asked the governor of Namur for soldiers that neither rode nor walked. The governor sent him two companies on stilts. This pleased the Archduke. He issued an order that the city would never again have to pay a beer tax. Even to this day, the peasants of the department of Landes in Gascony, France, use stilts in wading the marshes of their region and in crossing streams. These peasants can run on stilts with remarkable speed. They can also do

acrobatic stunts, such as to seem to fall accidentally and immediately arise to full height again. It is reported that one native of Landes left Paris for Moscow on stilts in 1891 and arrived there fifty-eight days later.

In America, stilts have long been popular for amusement. They are used by children in their play, by clowns in circuses, by comedians on the stage, by sandwich men on city streets, and by fancy skaters. The stilts used by experienced performers are attached securely to the lower leg by straps. The stilt walker carries a pole in his hand to help him keep his balance.

B.S.M.

**STILWELL, JOSEPH W.** (1883-1946), was one of the best-known American infantry officers of World War II. He was born in Palatka, Fla., and was graduated from the United States Military Academy in 1904. During World War I he led infantry units in a number of major battles in France. Shortly after the war he entered the University of California to study Chinese, and then went to China for three years of further study. He was again stationed in China from 1926 to 1929 and from 1932 to 1939, first as an infantry commander and later as military attaché. He became very familiar with the Chinese language and people, and with the country itself.

Early in 1942 Stilwell returned to China to become chief of staff to Generalissimo Chiang Kai-shek, and commanding general of all United States forces in the China-India-Burma theater of war. He was also given command of the Chinese forces in Burma. By his own admission, Stilwell took a terrific beating in Burma and had to retreat on foot about 140 miles through the jungle to India. But late in 1944, he led his forces back to the border of China and opened a road from India to China, which was named the Stilwell Road. See **STILWELL ROAD**.

But at about the same time, Stilwell and Chiang had a disagreement and Chiang asked that Stilwell be recalled. In June, 1945 Stilwell took command of the Tenth Army on Okinawa. After the war, he was given an infantry command in the United States. He died of an ailment he caught in Burma.

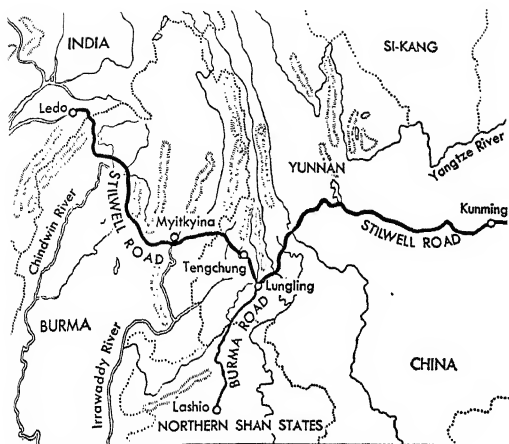
F.S.M.

**STILWELL ROAD.** The building of the Stilwell Road was one of the great engineering feats of World War II. The Stilwell Road was built to carry vital war supplies from India to China. It was begun in December, 1942. In October, 1943, General Lewis A. Pick of the United States Army Corps of Engineers took command of the project. By the efforts of his men and of thousands of native laborers, the road was pushed through mountains, jungles, and over rivers to Bhamo, Burma, where it joined the old Burma Road. It was completed in January, 1945, at a cost of \$37,000,000. Trucks carrying war supplies rolled into China for the first time since the Japanese occupation of Burma had cut off the southern stretch of the Burma Road. During the construction of



U.S. Signal Corps

**"Vinegar Joe" Stilwell** led American forces in East Asia during World War II.



Location Map of the Stilwell Road

the road, over 1,000 men lost their lives from malaria, floods, and the bullets of Japanese snipers.

The Stilwell Road began at Ledo, in Assam Province, India. It crossed the Patkai Range into Burma, ran southward toward Mogaung, Myitkyina, and Bhamo, and then eastward to China. Part of this last stretch followed the Marco Polo Trail, a path hundreds of years old. The road was 1,030 miles long and passed over 700 bridges. It was carved out of earth, and there was little or no rock to provide a solid roadbed.

The Stilwell Road was first named the Ledo Road. In January, 1945, Generalissimo Chiang Kai-shek renamed it to honor Major General Joseph Stilwell of the United States Army, who had planned it. The road was abandoned on November 1, 1945, after the United States Army Command declared that it could not be kept open economically in peacetime.

See also **STILWELL, JOSEPH W.**

**STIMSON, HENRY LEWIS** (1867- ), is an American statesman. He served in President Herbert Hoover's Cabinet as Secretary of State. Stimson was long known as an ardent enemy of aggression. In 1940, when war threatened, he joined the Democratic Cabinet of President Franklin D. Roosevelt as Secretary of War, in spite of the fact that he had long been a Republican leader. As secretary, Stimson played a large part in the Allied victory in World War II.



Harris &amp; Ewing

Henry Stimson served in the Cabinets of four Presidents.

Stimson was born in New York City, the son of a prominent surgeon. He was graduated from Yale University in 1888 and then studied law at Harvard University. In 1891 he began to practice law in New York City. Fifteen years later Stimson was named United States Attorney for the southern district of New York. From 1911 to 1913 he served as Secretary of War in the Cabinet of President William Howard Taft.

Stimson served as Governor General of the Philippines for a time, and then in 1929 was appointed Secretary of State. In this position he gained distinction by speaking out almost alone among the world's statesmen against the Japanese seizure of Manchuria. Between 1933 and 1940 he again practiced law. In 1945, he resigned from office and retired from public life.

E.E.Ro.

**STIMULANT.** Substances which excite the nerves and some of the organs of the body are called stimulants. Excited nerves send messages to and from the brain very swiftly. This makes one think and act more rapidly than is normal. Three common stimulants are the drugs *caffeine*, found in coffee and tea, *theine*, found in tea, and *nicotine*, found in tobacco. Alcohol acts at first as a stimulant, but later deadens the nerves. Stimulants are often habit-forming and may be unhealthful. Some stimulants are used by doctors to save lives. Two of them are *digitalis*, a vegetable compound, and *adrenalin*, a chemical compound. Both stimulate the heart to pump faster. See also **ADRENALIN**; **BENZEDRINE SULFATE**; **COFFEE** (Effects of Drinking Coffee); **DIGITALIS**; **TEA**. G.W.Br.

**STING.** See **ANT** (Weapens); **BEE** (The Sting); **MOSQUITO**; **SCORPION**; **WASP**.

**STINGAREE, STING ah ree, or sting ah REE.** See **STING RAY**.

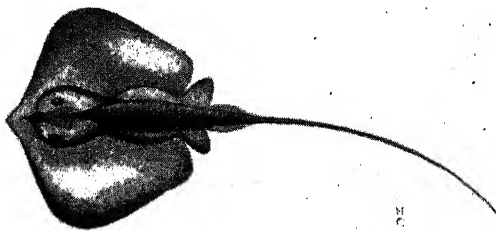
**STINGING NETTLE.** See **FLOWER** (color plate, Flowers of Plants Harmful to Man and Animal).

**STINGLESS BEE.** See **BEE** (Stingless Bees).

**STING RAY**, also called **STINGAREE**, is a ray, or flat-fish sea fish. Its most striking characteristic is a long, flexible tail with one or two sharp spines on the back of the tail near the middle. These spines have teeth along their edges. At the base of these teeth are poisonous glands. When the sting ray is disturbed or stepped on by bathers, it swings its tail upward. In this way it causes a most painful wound which is nearly as dangerous as a poisonous snake bite. The fish live on sandy to muddy bottoms in all warm shallow parts of the ocean and in bays. In South America the rivers flowing into the Atlantic Ocean are infested with small fresh-water sting rays that live as far as 2,000 miles above the mouth of the Amazon River. These rays have a flattened, disklike body. A sting ray that lives in the waters off Australia reaches a length of fourteen feet.

L.P.Sc.

**Classification.** Sting rays belong to the family *Dasyatidae*. There are about fifty species. The common sting ray is *Dasyatis centrourus*.



**The Flat-bodied Sting Ray** is a menace to bathers on both Florida and California coasts. The whiplike tail has a strong sharp spine which can inflict a serious wound.



**STINKHORN.** See MUSHROOM (Poisonous Mushrooms).

**STINKWEED.** See STRAMONIUM.

**STINNES, SHTIN es, HUGO** (1870-1924), was a German industrialist and financier who made a large fortune at the expense of the German people. He was born in Mülheim, and studied for a business and mine-operating career. During and after World War I he became one of the world's richest men, both through his business enterprises and as a result of the unstable money values in Germany after the war. German economy cracked but Stinnes profited by paying off large debts in money that was worth very little in real buying power. He became owner of mines, factories, steamship lines, newspapers, and many other businesses in all parts of the world. In 1921 Stinnes led an unsuccessful movement to build a great supertrust company which would control all the industries in Germany and regulate all of the imports and exports of German markets. After his death, his son allowed much of the business to be sold. H.U.F.

**STIPULE, STIP pool.** See LEAF (Stipules).

**STITCH.** See SEWING (Basic Stitches).

**STOAT, stoht.** See ERMINE.

**STOCK.** The name *stock* is given to three different garden flowers. The *evening stock* bears fragrant lilac or purple flowers which open up at evening. It is a small, branching annual plant from southern Europe. Its pods have two noticeable horns on the end. The *Virginian stock* is another annual with small white, red, or lilac-colored flowers. The stalk is short and the pods have no horns. The *Brampton*, or *common*, *stock* is a straight, sturdy plant about two feet high, with fragrant blossoms which may be of such colors as white, pink, red, purple, or yellow. It is popular in gardens. See also

FLOWER (Planting Table for Annual Flowers). A.C.Ho.

**Classification.** Evening stock is *Mathiola bicornis*. Virginian stock is *Malcomia maritima*. Brampton stock is *Mathiola incana*. All belong to the *Cruciferae* family.

**STOCK, CAPITAL.** If only two or three persons are associated in a business, a *partnership* is likely to be formed, and the evidence of each partner's share in the business is contained in a partnership agreement. If, however, the business is large and the capital is a sum so great that many partners are required, so simple an arrangement is not possible. In such an event, a *corporation* is formed, and the capital is divided into small sums called *shares*. All these shares together are the *capital stock* of the corporation. The shares usually are offered for sale to investors. Persons who buy stock for investment are known as *stockholders*.

The price of new stock is the *par* value of the stock. The price of the stock will vary with the condition of the corporation. Conditions are favorable when the corporation makes money. Then the price of the stock should rise above par. The price falls when conditions are not good. General business conditions or outlook may also affect the price. More shares of stock may be issued during the life of a corporation, or existing shares may be redeemed by the company.

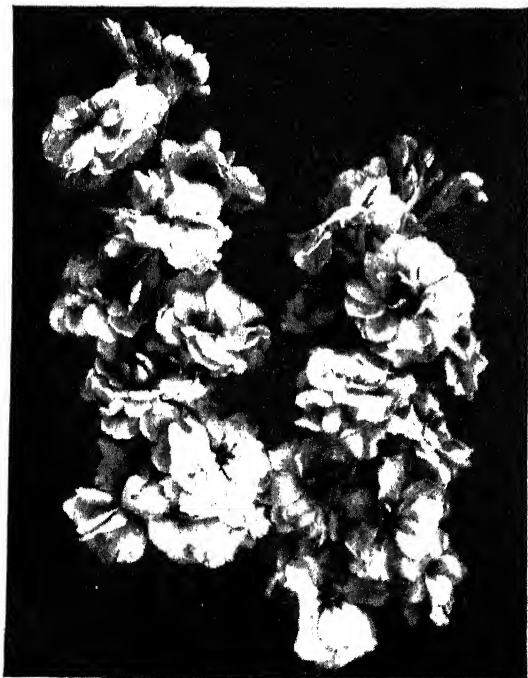
The par value of stock shares may be any amount. In large enterprises it is usually \$100. New York and several other states have allowed corporations to issue stock without any par value. The price paid for stock of this kind depends on conditions at the beginning of the enterprise, and after.

Stockholders cannot be assessed for the debts of a corporation. Failure of the business may make their stock worthless, but they cannot be made to suffer otherwise financially. The stockholder participates in the corporation, although he is not known as a partner. He has the right to vote for those men who shall direct the business, the *board of directors*. These men have the right to hire those who will operate the business. The officers, president, vice-president, secretary, and treasurer are responsible to the board. In elections to the board of directors, each stockholder's voting power depends on the number of shares he owns. If a man owns 51 per cent of the stock, he can outvote all the other members combined, and so control the elections. Sometimes a person who owns too little stock to outvote the others gains control of the elections. He does this by getting the voting rights, or proxies, of numbers of small stockholders who agree with him on the same issue. See PROXY.

*Dividends* are sums the stockholders share from the profits of a corporation. A dividend on stock is like the interest on a loan, except that interest is a fixed amount, and a dividend is an uncertain amount. If stock pays 6 per cent in a certain year, this would amount to a dividend of \$6 on each \$100 share. If some stockholders bought their shares for \$70 and the dividend is \$6 per share, the return on their investment would be 12 per cent.

Two kinds of stock are usually issued by corporations—*common* and *preferred*.

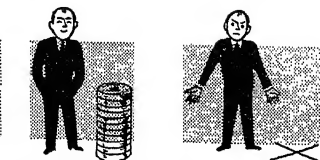
**Common Stock** is that which has no financial preference as to dividends. Common stockholders share in



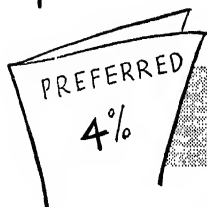
J. Horace McFarland

**Rosette Stock Blossoms** develop in soft colors which have an exceptional tone range. Stocks like cool temperatures.

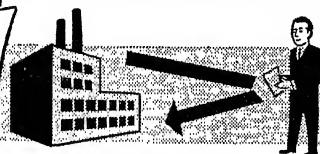
## TYPES OF STOCK



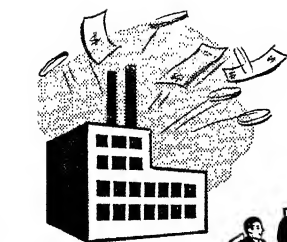
**Common Stock** is issued by corporations. It does not have guaranteed dividends.



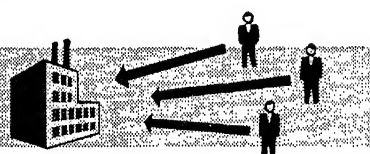
**Preferred Stock** pays dividends before common stock, but has no guaranteed income.



**Treasury Stock** is issued and sold, but reverts to the corporation either by purchase or donation.



**The Amount of Return** on any stock depends on business profits and the judgment of the directors.



**Common Stock** diverted to the corporation for new developments is one type of treasury stock.

the profits whenever the directors see fit to declare dividends. The dividends may be large or small, depending on the prosperity of the business and the judgment of the directors. Common stock is considered more speculative than preferred stock, because the amount of income from the investment is not definitely stated.

**Preferred Stock** is that which bears a fixed rate of dividend that must be paid before any distribution can be made on common stock. Another feature of preferred stock is that the dividends may be cumulative or non-cumulative. If the cumulative preferred stock dividends are not paid when they are due, they accumulate and must be paid out of future profits before any dividends can be declared on the common stock. Noncumulative preferred stock dividends are supposed to be paid out of the earnings each year. If they are not paid, the stockholder does not have any claim to back dividends as in the case of cumulative preferred stock. Preferred stock is bought for investment, and is not so speculative as common stock.

**Treasury Stock** is stock which has been issued and sold, but which has gone back to the business, either by purchase or donation. In some states a corporation may not buy its own stock, and in certain states there are restrictions on the amount that may be purchased. When corporations permit employees to buy stock, or give them shares, they may agree to buy back the stock if the employee leaves the company. Such stock would become treasury stock and would be held until sold. Common stockholders sometimes agree to donate a number of shares to the corporation to provide funds for new development. Stock acquired in this way by the

corporation concerned also becomes treasury stock.

**Watered Stock** is stock issued without increasing the assets of the company to back it up. This results in a false showing as to the amount of capital employed, and the actual value of the shares is "diluted."

**Abuses** in the issuing and sale of stocks and other securities led, in 1934, to the establishment of the Securities and Exchange Commission (SEC). L.T.F.

**Related Subjects.** The reader is also referred to:

Blue-Sky Laws	Investment Banking
Bookkeeping (Corporation)	Joint-Stock Company
Bookkeeping)	Limited Company
Capital	Securities and Exchange
Corporation	Commission
Holding Company	Stock Exchange

**STOCK, FREDERICK AUGUST** (1872-1942), was conductor of the Chicago Symphony Orchestra for thirty-seven years. In his later years he became known as the dean of American conductors. Stock was born at Jülich, Germany. His early musical studies were under the direction of his father, who was a bandmaster in the German army. After Stock was graduated from Cologne University, he continued his study of music. He settled in Chicago in 1895, and joined the Chicago Orchestra as a viola player. Four years later, he was appointed assistant to Theodore Thomas, then the orchestra's director.

Stock became known as a composer as well as a conductor. He wrote a concerto, a symphony, a number of string quartets and songs, as well as the *March and Hymn to Democracy*. Stock was musical director of Chicago's Century of Progress Exposition in 1933. G.B.



Ewing Galloway

New York Stock Exchange in Wall Street, New York City, is Often Called "The Nerve Center of American Business"

**STOCK EXCHANGE** is an association of men who take a business of buying and selling the stocks and bonds of railroads, utilities, and other industrial enterprises. The name *stock exchange* is also applied to the building in which the association conducts its business. A stock exchange deals in stocks and bonds in the same way that a board of trade buys and sells grain. Its members are the persons who wish to trade, purchase, or sell securities. The members of the exchange, or *stockholders*, pay a small commission on each business transaction they make.

The stock exchange grew out of a need for a convenient place to buy and sell securities. There were no stock exchanges in the late 1700's. A man who wished to buy or sell a stock had to find a broker, or agent, to do the business for him. In London, he usually found one, because he knew that brokers were there. Then in 1773, the brokers of London formed a buying and selling association and called it the *London Stock Exchange*. They set up an exchange where they could always go to conduct business in stocks and bonds. In New York, the first stock exchange was held under a cottonwood tree in Wall Street. Later, a stock exchange was built in New York City, and since then, stock exchanges have been built in many other places.

The stock exchange is a stock exchanges are the nerve center of business. The

number of enterprises whose shares were recognized. They thus protected the public from losing money on many stocks that were of questionable value.

**Kinds of Stocks.** In modern times, a *listed* stock is one that is handled by the stock exchanges. All other shares are *unlisted* and are barred from transactions on the exchange. Before a company can have its stock listed, it must satisfy the exchange that it has enough paid-up capital, that it is a lawful enterprise, and that it is in good financial condition. Federal laws regulate the issuance, listings, and trading of most types of stocks and other securities. These laws are administered by the Securities Act of 1933 and the Securities Exchange Act

Every day many stocks listed on an exchange are selling at prices which mark them as extremely undesirable, if not almost worthless. But the exchange regarded such stocks as sound when they were first admitted to the list. Unforeseen circumstances may have lessened the earning power of the company and so lowered the price that people are willing to pay for the shares. Prosperous times or better management of the company may increase the values. Suspicion and distrust may force the shares still lower. But the shares remain listed in justice to hundreds of stockholders who would have no other way of knowing the market value of their property.

**Stock Sells on an Exchange** at about its face value, or *par*, if the company issuing the stock is able to pay a reasonable return on its *capitalization* (total amount of shares it has issued). The value of shares goes up as the earning power of the company increases. Earning rates, or *dividends*, become larger. People are willing to pay

n shares  
were of

more than par value for such stock because the larger dividends mean more return on their investment. The earning power of some corporations is so great that their stock is worth \$500 or more for every \$100 share. But the same shares may drop to \$10 each if the corporation begins to lose money and meets financial reverses.

Stock exchanges also deal in the bonds of corporations whose stock they list. Most large daily papers print price quotations and sales of stocks and bonds in their market reports. The price of stocks and bonds serves somewhat as a business barometer. Business is prospering if the prices of stocks are rising or holding their own. A drop in the price of stocks and bonds indicates a general slump in business.

**Memberships in Exchanges** are worth large sums of money because there are only a limited number of them. The value of the memberships depends mostly on the present business conditions, volume of transactions, and the market level of the securities. The New York Stock Exchange has more than 1,300 members operating in about 500 brokerage firms. The price of a seat on this exchange has varied from \$34,000 in 1914, during a business depression, to a high of \$625,000 in 1928 and 1929. Other market centers have smaller memberships worth from \$1,500 to \$100,000 each. Every new member must be formally recommended and elected by the other members before he can buy a seat and operate on the exchange.

**Curb Trading.** Unlisted securities are bought and sold in curb trading. The name was first used in the early days when those who dealt in unlisted securities were barred from the exchange building. Such traders usually

conducted their business on the street in front of the stock exchange. In modern times, curb exchanges operate in most of the important cities that have regular associations. They have their own buildings, and daily newspapers report their markets as fully as those of the stock exchanges. There is a large amount of curb trading done, in spite of the fact that many of its securities are speculative and normally a risky investment. L.T.F.

See also BEARS AND BULLS; BOND (Market Price); BUCKETSHOP; STOCK, CAPITAL; STOCK TICKER.

**STOCKHOLDER.** See STOCK, CAPITAL.

**STOCKHOLM, *STOCK hohlm*** (population 654,864), is the capital and chief industrial center of Sweden. It is probably one of the most pleasant cities in the world. The sparkling cleanliness of the streets and buildings, the magnificent old palaces and churches, and the sharp clean lines of the many ultramodern office and apartment buildings make the city the perfect expression of the Swedish character.

Few cities are as attractive from the air as Stockholm is. It lies partly on several islands, and along the shores of Lake Mälaren and Saltsjön Bay. Its location on several islands has given it the name of "the Venice of the North." Many of the islands in the bay have wide beaches, and in the summer the surroundings are a popular resort for swimmers and sunbathers. In the winter there is ice skating, skiing, and other winter sports.

Stockholm has a large sports palace, a huge stadium, clubs for all kinds of sports, golf courses, and many parks for horseback riding and walking. Skansen Park has been a pleasure spot for the people of Stockholm

**The Old Open Market in Hötorget Plaza** makes a striking contrast to the crisp clean design of modern office buildings in

Stockholm's business district. Hundreds of persons crowd the market to buy vegetables, fruits, and brightly colored flowers. Sawders



since the 1600's. In the park there is an open-air museum of buildings which represent different provinces and historical periods of Sweden. These include an old pharmacy from the royal palace at Drottningholm, a combmaker's workshop, a glassmaker's house, and many other old buildings.

The modern Town Hall (completed 1923), with its three golden crowns, is perhaps the most beautiful building in Sweden. But its beauty is almost equaled by many historical buildings such as the Riddarholm Church, which was founded in the 1200's and has been the burial place of Sweden's rulers since the 1500's. Since 1721, Storkyrkan, Stockholm's oldest church, has been the place where all Swedish kings are crowned. The greatest treasure of the church is its statue of Saint George and the Dragon. Sten Sture the Elder set it up to commemorate a Swedish victory over the Danes in 1471.

Stockholm is Sweden's most important manufacturing center. Shipbuilding is one of the most important industries. Stockholm's factories produce metal, paper, cotton products, and all kinds of consumers' goods. Stockholm is Sweden's second-largest port and large ocean-going vessels can tie up at its docks. The Göta Canal connects Stockholm with Göteborg.

Stockholm was founded about 1255 by medieval Sweden's greatest statesman, Birger of Bjälbo. In the Middle Ages the Swedes fought many battles with the Danes in Stockholm before the Swedes established their independence of the Danish Kings. It was during this period that King Christian II of Denmark and Sweden had the chiefs of the rebelling Swedish nobility beheaded in the so-called "Stockholm Blood Bath of 1520." During the 1600's Stockholm became the capital of Sweden because of its strategic location. G.L.E.

**STOCK MARKET.** See HOOVER, HERBERT CLARK (Depression); STOCK EXCHANGE.

**STOCK RAISING.** See ANIMAL HUSBANDRY, and the list of Related Subjects at the end of the article.

**STOCKS.** The use of the stocks as a form of punishment dates back to Anglo-Saxon times. The Statute of Laborers, an English law of 1350, provided that unruly or drunken workmen should be punished in the stocks. The stocks was a wooden framework with holes for the head, arms, and legs of the victim. Persons who had broken the law were placed in the stocks for periods ranging from several hours to several days. Mobbs often threw stones, rotten eggs, and other objects at the prisoner, and sometimes persons in the stocks were stoned to death.

The North American colonists brought this method of punishment with them when they came to the New World. In New England women charged with being "common scolds" were sometimes punished in the stocks. In the southern states, disobedient slaves were often placed in the stocks. The use of stocks did not completely disappear until the early 1800's. See also COLONIAL LIFE IN AMERICA (illustration, Punishing Wrongdoers); PILLORY. A.E.W.

**STOCK TICKER.** This is an electric machine that prints stock quotations on a paper ribbon. It is called a *ticker*, in popular language, and the ribbon is named the *tape*. The stock ticker transmits information from



De Palma, Black Star

**A Clerk Reads the Stock Ticker Tape** as he follows the purchases and sales of stock in a large brokerage office.

one place to another on the principle of the telegraph. The New York Stock Exchange used a ticker for the first time on November 15, 1867. Before that time all price information was carried by mail or messenger.

There are about 6,000 stock tickers in use in the United States. The New York Stock Exchange uses about 3,500 of these machines. The others are maintained by the Western Union Telegraph Company.

**How the Ticker Works.** Suppose a customer in the Middle West orders his local broker to buy some shares of stock traded in only the New York exchange. The broker telephones the order to New York. A trader on the floor of the exchange calls out the order, and buys the stock from some other broker. The name of the stock, the number of shares bought, and the price is sent to a central transmitting room. The information is written on a machine that looks like a typewriter. This machine transmits the report to a control machine, which sends out all stock transactions to every ticker connected to the system.

The report of this trade will appear on the ticker tape in the office of the Middle Western broker four or five minutes after the customer has placed his order. In the late 1920's, the volume of stock trading was so great that at times the tickets were one or two hours behind the market.

In 1928 the New York Stock Exchange installed a new ticker that doubled the speed of the former machine. The new ticker cost more than \$4,000,000. But the cost was repaid by the promptness and certainty with which the new ticker sent market news to the in-

The ticker prints 60 figures or characters a minute, and as many as 100,000 characters a day. Many improvements were made to save time and to increase the amount of information a machine can carry. Stocks which were formerly identified with two symbols now normally have only one. For example,



United States Steel, which was known as *US*, is now simply called *X*. Other changes were made to permit the prices quoted on many stocks to be sent out in a block. This speeded up the sending of the huge volume of information which must be transmitted during a day's trading.

L.T.F.

See also STOCK EXCHANGE; TELEGRAPH.

**STOCKTON**, Calif. (population 54,714), is an important port on the San Joaquin River about seventy miles east of the Pacific Coast. Stockton was named by its founder, Captain Charles M. Weber, to honor Commodore Robert Stockton of the United States Navy. The Deep Water Project, begun in 1928, has provided the port with many more miles of water frontage. The channel is deep enough for almost all the large ocean-going vessels which pass through the Golden Gate at San Francisco Bay. Shipments from the port include farm products of the surrounding valley, paper, cedar lumber, and farm machinery. Stockton was chartered as a city in 1850. It is the home of the College of the Pacific and the seat of government of San Joaquin County.

P.R.H.

**STOCKTON, FRANK R.** (1834-1902), was an American novelist and short-story writer. His works are highly imaginative, and are read today chiefly for their lively style. He established his reputation in 1879 with the humorous novel, *Rudder Grange*. In 1884 he published the sensationally popular collection of stories, *The Lady or the Tiger?* The title story of this collection is his best-known short story, and has been translated into many languages. It is famous for its unusual ending.

Stockton was born in Philadelphia. After he finished school, he became a wood engraver and designer. In 1866 he began his writing career as a reporter on the Philadelphia *Morning Post*. Later, he joined the staffs of *Hearth and Home* and *Scribner's Monthly*. From 1873 to 1881, he helped edit the children's magazine, *St. Nicholas*.

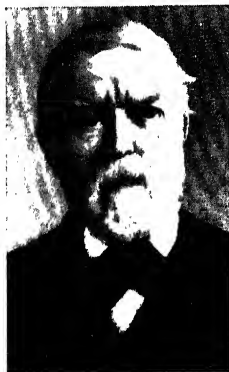
L.J.

**His Works** include the collections of children's stories *Ting-a-Ling*, *The Floating Prince and Other Fairy Tales*, and *The Bee Man of Orn and Other Fanciful Tales*; the novels *The Casting Away of Mrs. Leeks and Mrs. Aleshine*, *The Dusanter*, *Buccaners and Pirates of Our Coast*, and *Kate Bonnet*.

**STOCKTON, RICHARD** (1730-1781), was a colonial statesman and judge in New Jersey, and one of the signers of the Declaration of Independence. See also STATUARY HALL.

**STOCKYARDS**. See MEAT PACKING (Marketing of Live-stock).

**STODDARD, RICHARD HENRY** (1825-1903), was an American poet and literary critic. He was born at Hingham, Mass. In 1849 he published *Footprints*, his first volume of poems. From 1853 to 1870 he was an inspector of customs in New York City. Meanwhile, he wrote literary reviews for the *New York World*, and served as literary



Brown Bros.

**Richard Henry Stoddard**, American writer of verse

editor of the *New York Mail and Express* from 1880 until his death.

C.M.F.

**His Works** include *Songs of Summer*; *Abraham Lincoln*; *An Horatian Ode*; and *Poems*.

**STODDARD, WILLIAM OSBORN** (1835-1925), was an American author and inventor. He was one of the first persons to advocate the election of Abraham Lincoln as President of the United States, and from 1861 to 1864 he served as one of Lincoln's private secretaries. Stoddard was born at Homer, N.Y., and was educated at the University of Rochester. He then became a newspaperman in Illinois, where he first met Lincoln. From 1864 to 1866 Stoddard was United States Marshal of Arkansas, and later became engaged in various telegraph and railway enterprises. He received nine patents on his inventions in these fields.

E.S.W.

**His Works** include *Abraham Lincoln*; *Inside the White House in War Times*; and many books for boys.

**STOIC, STO ick**. During the 300's B.C., a philosopher named Zeno of Citium taught in the city of Athens. He was called "the Stoic philosopher" because he did his teaching at a place called the *Stoa Poikilē*, or *Painted Porch*.

Zeno taught that the only use of knowledge was to help man find his proper place in Nature. Nothing could happen which was not part of the perfection of Nature. It was man's duty to accept cheerfully whatever came — poverty, disease, persecution, slavery, or even death — secure in the knowledge that it was all for the best. A person who could do this was a true Stoic, strong, calm, and unmoved by good or bad fortune.

A good Stoic would ask himself whether or not each event was in his power. If it were in his own power, he could shape it as he wished. If it were not, he could accept it as the will of God. It would certainly do no good to worry and fret over events not in his own power to influence.

To understand and accept God's will was the one virtue. Practice of this virtue would make man truly free and truly wise. Whether slave or emperor, the true Stoic stood beyond hope or fear, and believed that he was therefore the equal of Zeus himself.

G.W.

See also EPICETUS; MARCUS AURELIUS; SENECA; ZENO.

**STOKE-ON-TRENT**. See ENGLAND (Cities).

**STOKER**. See HEATING (Coke and Coal).

**STOKOWSKI, stah KAWF skee, LEOPOLD ANTONI STANISLAW** (1882- ),

became one of the most famous conductors in the world. He was born in London, England, and was graduated from Queens College, Oxford University. After further study of music in France and Germany, he came to the United States in 1905, and later became an American citizen. From 1909 to 1912 Stokowski was music director of the Cincinnati Symphony Orchestra, and from 1912 to 1936 of the Phila-



NBO

**Leopold Stokowski**, colorful American conductor

delphia Symphony Orchestra. He toured South America in 1940, and later the United States and Canada, as conductor of the All-American Youth Orchestra. In 1944 he was appointed conductor of the National Broadcasting Company Symphony Orchestra. He wrote *Music for All of Us*. G.B.

**STOLA**, *STO lah*. See TUNIC.

**STOLE**, *stohl*. See DRESS (Nineteenth Century).

**STOLON**, *STO lahn*. See BOUNCING BET.

**STOMACH**. Man's stomach is a simple organ, compared with the complicated stomachs of the cow and other animals which chew their cud. The human stomach is a swollen part of the alimentary canal, just below the *esophagus*. It is shaped like a J, and is located in the upper left side of the abdomen. The upper end of the stomach connects with the esophagus. The lower

to be secreted by the pancreas. The stomach also passes food on to the small intestine at short intervals.

Food enters the stomach at the upper end from the esophagus. It is moved along by the powerful muscles of the stomach. These contract rhythmically, starting at the upper end of the stomach. The contractions pass in ringlike formation toward the lower end. This moves the food toward the pyloric end of the stomach. It also reduces the food to a pulpy mass. These contractions occur at regular intervals of about twenty seconds. They are called *peristaltic waves*. When the stomach is empty, these contractions make us feel hungry.

When the food reaches the pyloric end of the stomach, it is stopped by a ring of muscles located at the outlet of the stomach, called the sphincter. The sphincter opens only at certain intervals when the food is ready to be passed on to the intestines.

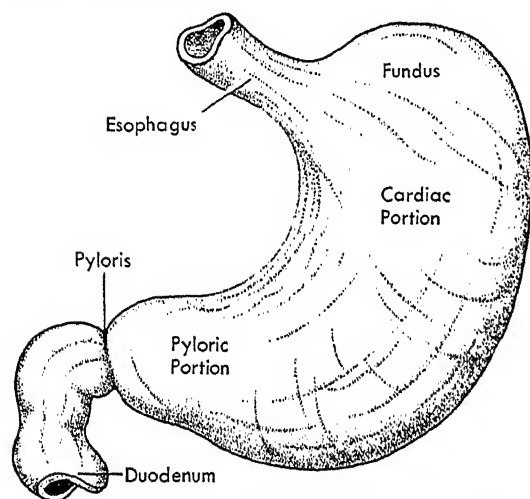
The time taken to empty the stomach varies with different individuals, and according to the type of food eaten. Water requires no preparation by the stomach. Therefore the sphincter lets water through almost immediately as soon as it enters the stomach. On the mixed diet which most persons eat, the stomach will empty in three to five hours.

The food in the stomach is acted upon by the gastric juice. This juice is a clear fluid given off by the glands of the stomach. It contains water, salts, hydrochloric acid, and two enzymes, called *pepsin* and *rennin*. Rennin is the enzyme that causes milk to clot. Pepsin speeds the digestion of proteins, and also clots milk. When the food comes into the stomach it contains *ptyalin*, which is a digestive juice formed from the saliva. This *ptyalin* digests cooked starch. Seventy-five per cent of the starch in a meal may be digested to malt sugar before the *ptyalin* is destroyed by the hydrochloric acid and gastric juice. Sugar, however, is not digested in the stomach.

Infants have an enzyme which digests fat in the stomach, called *gastric lipase*. This enzyme is not important in the adult. Digestion of the food in the stomach is not so important as digestion of food in the intestines. The stomach is not essential for life. It has been wholly removed in patients who have cancer of the stomach, and large parts of it frequently have been removed from patients who have gastric ulcers and small cancers.

**Diseases.** Many foods are irritating to the mucous membrane which lines the wall of the stomach. Such foods include highly spiced foods, extremely hot foods, and various kinds of alcoholic drinks. Food that is not completely chewed irritates the walls of the stomach by mechanical means. Our motions also affect the action of the stomach. Through investigations upon persons whose stomachs have been exposed, doctors have found that fear and anger strongly affect the secretion and contraction of the stomach. If you are worried or anxious, you should eat only liquid or semisolid foods. Strong emotions, with the eating of coarse foods, make an individual susceptible to the development of a gastric or stomach ulcer, or a *duodenal ulcer*. Most ulcers occur in the duodenum, or in the first inch of the small intestine which is first to receive the acid contents of the stomach. Excessive use of beverages containing alcohol or caffeine, and of tobacco, make a person more

## THE STOMACH



end of the stomach opens into the duodenum, which is the upper part of the small intestine. Like the intestines, the stomach is a muscular organ with considerable ability to contract and expand. The shape of the stomach changes with the amount of food which it contains. When the stomach is nearly empty, it is flattened and tubelike. When filled with food it may be swollen considerably. The average capacity of the adult stomach is a little over one quart, but the stomachs of individuals may differ from one to another. Tall thin people usually have long, narrow stomachs. Short, stocky people usually have stomachs that are short and wide.

The position of the stomach is different in different persons. It may vary in the same individual according to the changes in his condition.

**The Work of the Stomach.** The stomach is one of the most important of the digestive organs. It serves as a reservoir for food, so that a large meal may be eaten at one time. It churns and mixes the food with gastric juices it produces. This makes a pulpy liquid from more or less solid material. The stomach partly digests the proteins in food by means of the hydrochloric acid and pepsin which are given off by glands in the stomach. The hydrochloric acid has an antiseptic action on the food, and tends to make it easier for pancreatic juice



**A Group of Stone Age Men** gather about a fat stag they have killed with their stone-tipped spears and crude bows and arrows. Standing at the left, a woman with a baby watches as

susceptible to the development of ulcers. These ulcers may be treated by means of special diets, which often contain milk. In severe cases the ulcers may have to be treated by surgery. Some persons' stomachs do not secrete enough hydrochloric acid, and the acid must be added to the stomach before each meal. A.C.I.

See also ALIMENTARY CANAL; DIGESTION (with list); GASTRITIS; GASTROSCOPE; NAUSEA; ULCER.

**STOMACH-ACHE.** See INDIGESTION.

**STOMACHER.** See DRESS (Renaissance to End of the 16th Century).

**STOMATA, STO mah tah.** See LEAF (Parts of a Leaf).

**STONE.** See BUILDING STONE; ROADS AND STREETS; ROCK.

**STONE,** a unit of weight. See WEIGHTS AND MEASURES (Miscellaneous Units).

**STONE, FRED ANDREW** (1873- ), became a popular American comedian and dancer. He had leading parts in musical shows which were popular with children as well as adults, including *The Red Mill*, and *The Old Town*. In 1903 he played the part of the Scarecrow in *The Wizard of Oz*, in which David Montgomery played the Tin Woodman. Montgomery and Stone became the best-liked musical-comedy team in the United States. Stone also acted in motion pictures in later life. He was born in Longmont, Colo., and made his first stage appearance at the age of eleven. B.M.

**STONE, HARLAN FISKE** (1872-1946), was Chief Justice of the United States Supreme Court from 1941 until his death. He was born at Chesterfield, N.H. He was a farmer's son, and went to agricultural school at Amherst. But he engaged in so many escapades that he was expelled. He then entered Amherst College. He studied at the Columbia University law school. From 1899 to 1905, when he resigned, Stone taught law at Columbia. For a time he practiced law privately in New York City and became known as a successful corporation lawyer. In 1910 he became dean of Columbia University. President Calvin Coolidge appointed him Attorney General of the United States in 1924, and soon afterward appointed him Associate Justice of the Supreme Court. Stone was known as a man of conservative associations, but he joined Oliver Wendell Holmes and Louis Brandeis in upholding liberal and pro-

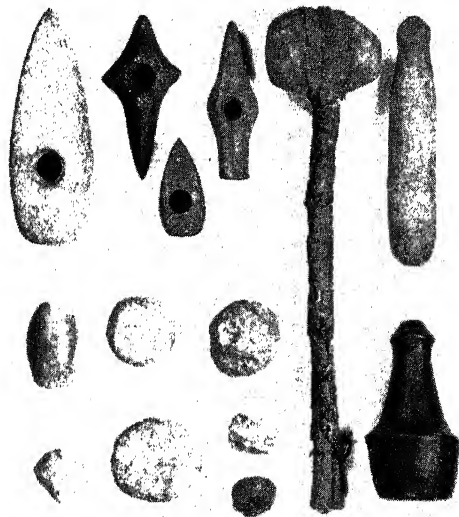
gressive measures. See also SUPREME COURT. W.S.E.  
**STONE, NICHOLAS** (1587-1647). See SCULPTURE (England).

**STONE, PRECIOUS.** See GEM.

**STONE, WARREN SANFORD.** See BANKS AND BANKING (Labor Banks).

**STONE AGE.** Many thousands of years ago, the peoples of the earth knew nothing about the use of metals. Their weapons and implements were made of stone, wood, bone, and horn. This early period in human history is known as the Stone Age.

Most anthropologists believe that the Stone Age began about 100,000 B.C. and ended about 4,000 B.C. A few peoples in distant corners of the world are still in their Stone Age. Savage tribes in New Guinea and some



American Museum of Natural History

**Seven Crude Stone Implements of the Old Stone Age** are shown in the lower left corner of the illustration. Very little attempt has been made to shape them. The other implements are from the later period of the New Stone Age. They were fashioned with considerable skill and for definite uses. Handles were attached through holes or by means of thongs.

of the Eskimo of the Far North still use the crude implements of primitive men. But most peoples have long passed beyond the civilization of the Stone Age.

The Stone Age left its mark among all the scattered peoples of the globe. In Europe, Asia, and Africa, primitive men lived on the bare necessities of life. At the time America was discovered, most of the American Indians were still in the Stone Age.

The people of the Stone Age were in constant fear of attack from the cave lion, the woolly rhinoceros, the mammoth, the cave bear, and other beasts which no longer exist. These people left no written records because they did not know how to write. Only remains and relics of the ancient people give any clues as to the kind of life they led. Scientists have found these relics in caves, riverbanks, and burial mounds. They have discovered axes, knives, daggers, spear tips, arrowheads, saws, and chisels. Some of the relics are made of chipped flint, and others are of polished stone. Carved bits of bone and crude pottery have also been found. Some Stone Age people made rough paintings of men and animals on the walls of their caves. These paintings tell something of the way the people lived. Later in the Stone Age, the people moved out of their caves and into wigwams made of animal skins. Still later they moved into more permanent dwellings, such as the lake villages of Switzerland. They raised cattle and sheep, and they began to farm the soil with crude tools.

Some people of the later Stone Age built great chambers of enormous stones. These were sometimes covered with a mound of earth. Scientists call them *megalithic monuments*. They probably started as stone coverings over burial holes dug in the ground. Sometimes the megaliths were grouped together in a *dolmen*, or burial chamber. These monuments have been found in Asia, Europe, and northern Africa. They indicate that the people who built them lived together in some kind of society, because moving the heavy stones for the monuments required the work of many men.

Scientists divide the Stone Age into two parts, the Old Stone Age (*Paleolithic*) and the New Stone Age (*Neolithic*). The Old Stone Age covers the earliest years of the ancient period. It is sometimes known as the "age of chipped stone," because men were able to make only rough stone tools. These early very crude tools are sometimes called *coliths*. During the New Stone Age humans began to make highly finished stone implements. About 4000 B.C., metals came into use in Egypt and Mesopotamia, and the Stone Age ended in most parts of the world.

Two of the best-known types of the Old Stone Age are the Neanderthal and the Cro-Magnon man. A.V.K.

**Related Subjects.** The reader is also referred to:

Ancient Civilization	Folsom Man
Archaeology	Iron Age
Bronze Age	Neanderthal Man
Cave Dweller	Primitive Man
Cro-Magnon Man	Shelter (Neolithic Dwellings)

**STONECHAT** is the name of a small European bird of the thrush family. It takes its name from its peculiar note, a sound like that of two pebbles struck together. It is an attractive bird with black head and throat and chestnut under parts. The stonechat is restless and active, and is usually found in open, grassy locations.



K.P.

#### The Stonechat Gets Its Name from Its Peculiar Call

It builds its nest on the ground, under a tuft of grass. The female lays four to six eggs of a greenish-blue color, and faintly spotted. In winter the bird flies to Africa. It feeds on insect larvae, worms, beetles, and seeds.

A.A.A.

**Classification.** The scientific name of the stonechat is *Pratincola rubicola*. It belongs to the family *Turdidae*.

**STONECROP** is the common name for the group, or genus, of plants that is also known as the live-forevers. These plants are grown in rock gardens and in flower-bed borders. The stonecrop grows in the northern parts of the Temperate Zone. It can grow in almost any kind of dry, sandy soil and is often found in soil that will not support other plants. The stonecrops are low herbs that grow very close to the soil. However, some species are a foot or more tall. The leaves are always fleshy, that is, juicy and thick. Many of its species have thick stems that grow under the ground. These stems have nodes which sprout new roots and stems. The flowers of the stonecrop are small and may be white, yellow, rose, or purple.

A.C.H.

**Classification.** The stonecrop is the common name for the genus *Sedum*. The common wild species of live-forever is the *Sedum telephium*.

**STONE FLY.** The stone fly is an insect that lives its immature stages in the water. Its name refers to the fact that its larvae attach themselves to the under side



U.S.D.A.

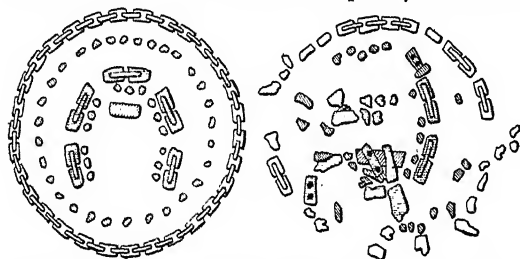
**The Stone Fly Is Usually Found Near Brooks or Streams**

of stones. Stone-fly larvae are carnivorous, for their food consists largely of the nymphs and larvae of smaller aquatic insects. Some stone flies appear as adults so early in spring that they can be seen crawling in numbers over the snow.

E.W.T.

**STONE FRUIT.** See FRUIT AND FRUITGROWING (Kinds of Fruits).

**STONEHENGE**, *STOHN henj*, is a very ancient monument on Salisbury Plain, in Wiltshire, England. It is a group of huge, rough-cut stones. No one knows exactly who placed them there or when, and as a result it has been called "the Riddle of Salisbury Plain." Some scholars believe sun worshipers built Stonehenge as early as 1800 B.C. Other scholars date it as late as 500 B.C. Historians base this date on pottery and other



**The Plan of Stonehenge**, as scholars believe it was originally built, is shown at the left. The other illustration indicates the positions in which the remaining stones were found before they were replaced according to the plan.

objects dug up on the site. Perhaps the Druids also used the structure as a temple. See DRUID.

For hundreds of years the great stones gradually fell or were carried away to make bridges and milldams. But from the positions of many of the stones still remaining in place, scholars can guess what the monument probably looked like originally. Thirty huge upright stones stood in a large circle, 105 feet around. Across the tops of these stone were thirty other stones. Inside that circle



Miller, Black Star

**The Great Blocks of Rock at Stonehenge** still puzzle scientists. They ask, "Who put them there? When? For what purpose?"

was another circle of forty smaller stones. Inside this smaller circle were two other sets of stones. These stones stood like two horseshoes, one inside the other, with the opening toward the northeast. Near the center curve of the inner horseshoe was a flat block of blue marble, 15 feet long, which was probably an altar. This stone, and two others in line with it, were arranged in a special way to point toward the rising sun on the longest day of the year. The arrangement seems to show that they were used to tell the time of the summer solstice. For this reason, some scholars say that Stonehenge was connected with sun worship. The entire monument was surrounded by an earth wall about 300 feet around.

In 1922 the British government began to restore Stonehenge. Scattered stones were put back as they had been originally, and missing ones were replaced. Today the monument stands as a remarkable relic of some early civilization. The government takes care of it and charges a small fee for admission.

T.F.H.

**STONE MARTEN.** See FUR INDUSTRY (Names of Furs).

**STONE MOUNTAIN** is a huge, rounded mass of light gray granite, about sixteen miles east of Atlanta, Ga. It is the largest stone mountain in North America. At its highest point it measures 650 feet, and it is about two miles long. A huge relief sculpture is being carved on the face of this mountain as a memorial to the heroic struggle of the South during the War between the States. When the memorial is complete, it will be the largest piece of sculptured work ever made.

The memorial will be made up of three groups of figures. The first and second groups have been completed. The first consists of figures of General Lee, General Jackson, and Jefferson Davis on horseback, ready to review the army. You can get some idea of the size of the figures when you know that thirty persons sat on Lee's shoulder when the head was unveiled. The second group is made up of two color-bearers and four other generals, chosen by the historical societies of the South. The third group will show the marching army, which is designed to look as if thousands of soldiers were marching. Thirteen Ionic columns will be carved at the ground level, one for each Confederate state. They will form an entrance to a huge memorial hall. This hall will be carved out of the rock, and will be dedicated to the women of the South. The plan also includes a tomb of an unknown soldier, and a museum.

The figures are carved by workmen with power drills. They cut according to holes traced in the rock. These holes follow the outline of the sculptor's master models, and every measurement must be in exact scale.

Gutzon Borglum was the first sculptor to work on the monument, which was started in 1923. In 1925 H. August Lukeman took over the work. He made entirely new designs for the group of figures on horseback. While he was in charge of the work, the head of General Lee's figure was blasted away. Work stopped on the monument in 1928 because of lack of funds. Then in 1931 the Georgia legislature authorized the governor to appoint a State Memorial and Monument Commission. This commission replaced the Stone Mountain Confederate Memorial Association, which had been in charge of the monument. In 1941 the commission selected Julian Harris, an Atlanta sculptor, to complete the memorial.

By act of Congress on June 18, 1923, the minting of 4,000,000 Stone Mountain half dollars was authorized. Only 2,500,000 were actually minted and issued. Approximately 1,500,000 of these half dollars have been sold.

F.Ho.

See also BORGUM, GUTZON.

**STONE OF DESTINY**, or **STONE OF SCONE.** See CORONATION.

**STONE RIVER**, or **MURFREESBORO, BATTLE OF.** See WAR BETWEEN THE STATES (Principal Battles).

**STONEWALL JACKSON.** See JACKSON, "STONEWALL," THOMAS JONATHAN.





American Stoneware Pitcher of the Early 1800's

**STONEWARE** is a type of pottery used for jugs, crocks, water coolers, kitchenware, various types of heavy dishes, and vessels for chemicals. It is usually gray or white in color, but is sometimes given attractive colored glazes. The body of stoneware is hard and strong. It is vitrified, or given a glossy sheen, by heat. Clays are used which can be baked with a great amount of heat. This ware will not absorb liquids or leak, and does not need expensive glazes. Usually stoneware does not have any decoration.

Stoneware is often used for large, thick-walled vessels for use in factories, hotels, restaurants, and on farms. Large food containers for mixing and storing are often made of stoneware. They are sometimes used in grocery-store display counters for butter, cheese, and pickled foods. Some of the very large stoneware vessels hold fifty gallons. Stoneware is also used for some types of art pottery.

Early American stoneware included such articles as churns, butter pots, mugs, jugs, and pitchers. Sometimes designs in cobalt blue, a dark, greenish-blue color, were applied to these pieces under the glaze. Early stoneware pieces were also sometimes given a salt glaze. White stoneware is believed to have been made in New Jersey as early as 1684. Tulips were often painted on this type of pottery. When groups of three tulips were used, they had a religious meaning and symbolized the Holy Trinity, or Father, Son, and Holy Ghost.

At the present time stoneware is made chiefly in large stoneware potteries in Ohio and West Virginia. But there are also several potteries which manufacture stoneware in California, Illinois, Texas, and Washington.

W.M.M.



English Salt-glazed Stoneware Figure, Made about 1750  
Metropolitan Museum of Art

**STONG, PHIL** (1894- ), is an American writer of novels and stories for both young people and adults. His first book, *State Fair*, was very popular and was made into a successful motion picture.

Stong was born in Keosauqua, Iowa, and was educated at Drake University. He worked on newspapers in New York City. Most of his writings are about Iowa life.

**His Works** include the novels *Week End*, *Farmer in the Dell*, and *Ivanhoe Keeler*; *Hawkeye*; a *Biography of the State of Iowa*; and the children's stories *The Hired Man's Elephant*, *Captain Kidd's Cove*, and *Way Down Cellar*.

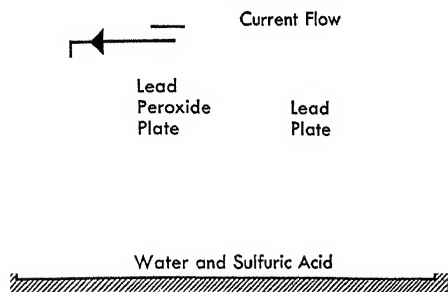
**STORAGE BATTERY.** The storage battery is a device in which chemical energy is stored, so that it can be released in the form of electrical energy at any given time. In England it is often called an *accumulator*.

An experiment will help in understanding the storage battery. Connect four dry cells in series, with the negative pole of each cell connected to the positive pole of the next. With two wires, connect two strips of lead to the two remaining terminals. The lead strips should measure at least one by four inches. Place the strips in a solution having one part of strong sulfuric acid ( $H_2SO_4$ ) to twenty parts of water. Bubbles of hydrogen will rise from one of the lead strips (the negative plate), and a red coating will appear on the other (the positive plate). After a few moments, disconnect the dry cells. The strips and the acid together form an electric battery. Strictly speaking, it is only a *cell*. But we now use the term battery to mean a single cell as well as several cells. The current from the dry cells produced a chemical change on the lead plates. The positive plate became coated with lead peroxide, while the negative plate remained

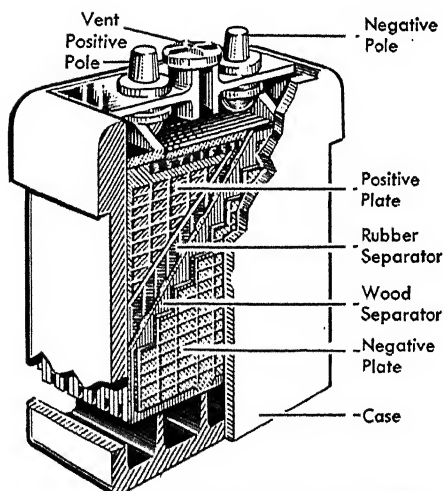
pure lead. The battery is then said to be charged.

Now join the lead strips with a wire, and connect them to an electric bell. The bell will ring. The acid is changing the oxide of lead back to lead sulfate, which in the subsequent charging process will be converted to lead peroxide again. When the two plates were connected by an electrical conductor, this chemical action

## THE STORAGE BATTERY



The battery stores chemical energy, which changes to electrical energy when the circuit is closed. Acid acts more rapidly on the peroxide plate than on the other.



Chemical energy to make electricity is stored in the series of plates made in the form of grilles.

produced an electric current. The battery is now dis-

When the above chemical reaction is complete, a battery is said to be run down. The storage battery may be recharged by passing an electric current through the battery in the opposite direction from that in which the current flows out of the battery. This is just what we did in the first part of the experiment above. In all other types of batteries, such as the dry cell, new solution

and new zinc plates must be supplied to the batteries.

**Commercial Storage Cells** have plates in the form of *grids*. The openings in the positive plate are filled with lead peroxide. Those of the negative plate are filled with porous lead. When the cell is discharged both plates hold lead sulfate.

**The Edison Storage Battery** has grids of sheet steel. The positive plates comprise nickel-plated steel grids supporting steel tubes, also nickel plated. The tubes are filled with nickel hydrate, which changes to a nickel oxide in forming the plate. The negative plates are filled with an oxide of iron (ferrous oxide). The liquid is a solution of caustic potash (potassium hydroxide). The Edison battery will stand more severe usage than the lead battery but has a higher internal resistance and thus does not readily supply the very high momentary currents needed for such applications as starting an automobile. Its voltage is about 1.1 volts for each cell. That of a lead battery is 2 volts.

**The Use of the Storage Battery** with which we are most familiar is in gasoline-driven automobiles, where it both starts and lights the car, and is charged by a generator run by the automobile engine. In electric cars it is the sole source of power. When steam-driven trains are halted, they are lighted from storage batteries. Submerged submarines get all their power from storage batteries. These batteries also operate telephone and other systems which are not connected with power-station service.

P.H.C.

See also ELECTRIC BATTERY.

**STORE.** See BUSINESS; CHAIN STORE; CO-OPERATIVE; DEPARTMENT STORE; ECONOMICS; FOOD.

**STORK.** The stork is a large bird with long legs and strong wings. It looks for its food in marshes and swamps, but often nests on roofs and chimneys, close to the homes of men. Storks eat eels, frogs and toads, rep-



Seidenstücker, Black Star

**The Black Stork** is unlike the white stork in habit. The latter seeks out cities and towns with chimneys and crannies in which to nest. The black stork shuns them.



Black Star

**A Fledgling Stork** balances on the edge of the nest as one of the parents glides in on long wings, ready to alight.

tiles, young birds, and small mammals. They are related to herons and ibises. The best-known stork is the *white stork*. It is found in summer throughout most of Europe and Central Asia. In the winter it flies to Africa and northern India. This stork has pure-white feathers, with black feathers on its wings. Its beak is red and its long legs and feet are a reddish pink. A pair of storks will return year after year to the same nest, building onto it until it is several feet in height. The female lays three to five white eggs in the nest.

Other storks of the Eastern Hemisphere are the *Japanese stork*, the *black stork*, the *white-necked stork*, and the *adjutant*. In South America are found the *maguari* and the *jabiru*, a bird five feet high. The *wood ibis* of the southern United States is also a true stork.

Much folklore has grown up about the stork. It is a respected and protected bird in many places, especially in Germany and The Netherlands. The Germans and the Dutch like storks because they are useful in destroying insects and reptiles. They also believe that the stork brings good luck. The faithfulness of the pair of storks is considered a model of married happiness. The familiar legend that the stork brings the new baby into the home arises from its loving care of its own young. A.M.B.A.

See also ADJUTANT; BIRD (Bird Courtship; illustration, Unusual Nests); JABIRU; MARABOUT.

**Classification.** The stork family is *Ciconiidae*. The white stork is *Ciconia ciconia*.

**STORM.** Storms are disturbances of the atmosphere, usually marked by strong winds, rain, snow, or hail, or by a combination of two or more of these. Storms would be unknown if the temperature of the air everywhere

were equal. The air in low latitudes is heated, however, while that in high latitudes is cooled. The air over oceans is warmer than that over continents in the winter, and cooler in summer. These differences in temperature also result in differences in pressure. Over warm areas the pressure is relatively low, while over colder areas it is high. As cold air accumulates in the high latitudes, there is a tendency for large masses of it to spread out toward the equator. Eventually these large masses break off into separate, wandering masses of cold air which move generally eastward toward the equator. In the middle latitudes, these masses of cold air usually meet warm air masses which have come up from low latitudes. Wherever warm and cold air masses meet, a struggle develops, which may result in storms. There are many different kinds of storms, but all of them are due to differences in temperature, pressure, and humidity.

E.S.S.

**Related Subjects.** More detailed information as to the causes and character of storms will be found in the following articles:

Barometer	Rain
Blizzard	Sandstorm
Cloudburst	Sleet
Cyclone	Snow
Dust Storm	Sunspot
Hail	Thunder
Heat Lightning	Tornado
Hurricane	Typhoon
Lightning	Waterspout
Painting (color plates,	Weather
Great American Paintings;	Whirlwind
Great European Paintings)	Wind

**STORM, THEODOR** (1817-1888). See GERMAN LITERATURE (Rise of Nationalism).

**STORMALONG, ALFRED BULLTOP**, is a character in American folklore. Just as Paul Bunyan is the greatest lumberman, Stormalong is the greatest sailor. He performs amazing feats of seamanship aboard the sailing ship *Courser*, which is so big it can barely squeeze through the English Channel. Many stories have been told about Stormalong, and several books have been written about him.

**STORMY PETREL.** See PETREL.

**STORTING, STORH RING, or STORTHING.** See NORWAY (Government).

**STORY, JOSEPH** (1779-1845), was an Associate Justice of the United States Supreme Court from 1811 to 1845. He was born at Marblehead, Mass., and was graduated from Harvard College in 1798. In 1801 he began to practice law and later served in Congress. From 1829 until his death Story was also professor of law at Harvard College. As a member of the Supreme Court he followed closely in the footsteps of John Marshall. But as the author of a series of legal works, he did much to shape American concepts of common law.

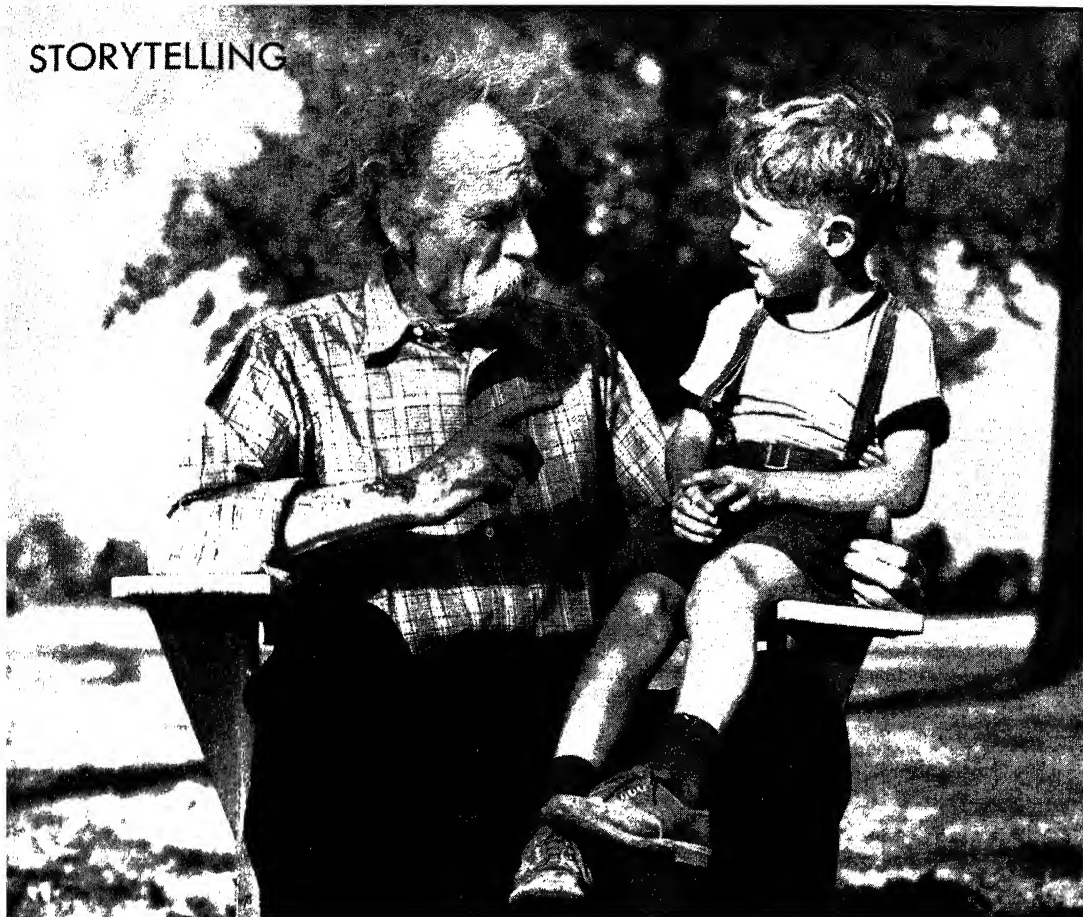
W.S.E.



Brown Bros.

**Joseph Story** helped lay the foundations of American legal practices.

## STORYTELLING



H. Armstrong Roberts

**STORYTELLING.** Storytelling is as old as man's ability to talk. Crude drawings on the walls of primitive cave dwellings illustrated the hunting adventures of the man of the family. It takes little imagination to see him returning from the hunt to tell of a narrow escape from death, and later inscribing the story on the cave walls. Thus the tale of personal exploit, the earliest form of storytelling, came into being.

It was thousands of years before life was anything but a struggle for survival, and man's intelligence was only a degree above that of the animal kingdom. Finally, man became aware of the forces of nature, and fear and awe were born. Here were power and action outside of himself. His attempts to explain them resulted in the myth and the hero tale.

Later man learned that it was safer for him to live in community groups than in isolated dwellings. Out of this type of living came the story for entertainment. It became the responsibility of especially gifted persons to tell such tales for the amusement of all members of the tribe. Literary form was in the making. A good story became more important than historical accuracy, and presently the folk tale developed.

Closely associated with the myth and the folk tale were the animal stories. Primitive people recognized life in all things. They were particularly interested in such questions as "Which came first, animal or man?" and "Do animals have souls?" These early storytellers

also showed the dawning of a sense of humor, one of the outstanding characteristics of civilized man. In their animal stories, they gave human faults to animals, and thus were able to make a point that might offend if these faults were attributed to human beings. As a consequence, fables and totem tales are now a recognized part of man's literary heritage.

For hundreds of years stories were carried by word of mouth not only within the borders of a single land, but also from country to country. These stories were spread chiefly by professional storytellers.

The great era of storytelling was from the 1000's to the 1500's. Most storytellers enjoyed the patronage of a king or a noble who engaged the storyteller to live at his castle. These men wrote ballads and songs describing important events, and recited these for the entertainment of the family and guests. These stories were usually told to a musical accompaniment. In southern France, such storytellers were called troubadours. In northern France they were called trouvères. In Iceland and Scandinavia they were called skalds, while in Wales they were bards. The Ollamhs of Ireland were organized into nine groups, each of which told a different kind of tale. Germany first had the Minnesingers, who were singers of romantic love ballads. They were succeeded in the 1300's by the Meistersingers, who were members of musical and poetic guilds. It is reasonable to believe that stories spread throughout Europe

and the Near East through the roving of the gypsies and the travels of the pilgrims and the Crusaders. There is small wonder that there is often marked similarity in the folk songs and tales of the different countries of Europe.

Storytelling is still an art, requiring creative imagination and skill as much as music or painting. In modern times, the art has been kept alive by a few real storytellers. Marie Shedlock, an Englishwoman, was noted for her ability to interpret the fairy tales of Hans Christian Andersen. Phonograph records have been made of the Icelandic eddas and Norwegian folk tales told by Gudrun Thorne-Thomsen. Other famous storytellers include Ruth Durand Sawyer, Sara Cone Bryant, Edna Lyman Scott, Richard T. Wyche, and Mary Gould Davis.

Important contributions to the art of storytelling are being made every day by children's librarians. Story hours, in which children too young to read are being taught to love the drama and imagination of stories, are now a recognized part of the services of a good library.

There is a Storytellers League which is keeping alive the traditions of the great storytellers. Perhaps some day there will be a Storytellers Guild, modeled after the guilds of the Middle Ages. The modern apprentice should learn his techniques not only from the literature of storytelling, but also from the contemporary forms of entertainment, such as the radio, television, and motion pictures.

#### How to Tell a Story

While it is given to only a few of us to be great storytellers, almost anyone can tell a story well enough to interest children. Very young children like folk tales,

animal stories, and poetry. Hero tales, myths, and ballads are enjoyed most by children of ten years or older. Fables are enjoyed by persons of all ages. The primary purpose of all storytelling is to entertain. If horizons are widened and the listeners get a feeling of oneness with all people in the process of being entertained, that is to be regarded as a happy by-product of the storyteller's entertainment.

There are general principles in storytelling which will help the beginner in this fascinating art. These chief points are the following:

1. **Like the Story** you propose to tell. If you don't like it yourself, it is safe to assume that no one else will. The storyteller has access to the great literature of all time. Find the stories that give you pleasure, and share your pleasure in those stories with others.

2. **Know the Story.** A story must be read many times before the storyteller can really become acquainted with it. The storyteller should first read it through as a story, with no critical intentions. The story should then be read again to analyze its construction. The third reading should be for the purpose of visualizing the story as a series of pictures or episodes.

After three readings, the storyteller should then simply think about the story for awhile. If he tries to hurry the learning process, he is not likely to do as well. The next step is to tell the story aloud to yourself. This will help you to get used to the sound of your own voice, and it is also a means of learning the amount of time it will take to tell the particular story. The story should then be read again for phraseology, rhythm, and style. *The storyteller should make no effort to memorize the story word for word.* Instead, it should become his own story. Make sure of shades of meaning in words, and use an unabridged dictionary when in doubt as to the meaning of a word. You are dealing with words, the greatest creative agent in the world.

3. **Tell the Story Skillfully.** The mechanical techniques of storytelling are most important. The storyteller should

Games End Quickly as Prekindergarten Children Gather around Their Teacher for Storytelling Time







Kindergarten Children Listen with Eager Attention as One of Their Classmates Tells Them a Story

Harold M. Lambert

learn to breathe from the diaphragm so that the breath will sustain every word.

Learn to use the "sounding boards," or resonance chambers in the head and chest, so that tones will be rich and well-rounded.

The audience should be carefully watched while the story is being told. If their attention wanders, it is the fault of the storyteller. Children will quickly show whether the words are too difficult for them. In this case, the storyteller must quickly describe the picture in simple terms that they can understand. But the story should not be made too simple. Most children love "non-sense" words, and an occasional word whose meaning can be learned from the story itself. Give them a chance to grow, and to learn that words are fun.

Remember that storytelling and acting are two different arts. Too many gestures on the part of the storyteller will distract the attention of the listeners. In storytelling, the audience forms its own mental pictures from your words and your voice. The storyteller should also learn the value of tempo and pause. The right timing is an important part of the storytelling technique, and can only be learned with practice.

The literature of storytelling is not limited to classical and traditional sources. But these sources do constitute the background and establish a standard of comparison by which the storyteller can judge modern material. To be suitable for storytelling, it is essential that a tale have one or more of these characteristics: a folklore flavor; distinctive literary style; high ideals; and a quality of rich imagination.

Titles of books suitable for storytelling are listed, under the names of the countries in which they originated, at the end of this article.

### Storytelling around the World

**The Earliest Record** of storytelling is *The Tales of the Magicians*, which was written on papyri in Egypt about 4000 B.C. In this, the sons of Cheops, an Egyptian king, take turns telling strange and adventurous tales to their father. This device of collecting different tales around a central theme has been followed ever since. Examples of this are found in *The Thousand and One Nights*, Boccaccio's *Decameron*, Chaucer's *Canterbury Tales*, and the *Heptameron* of Margaret of Navarre.

**India and the Near East** have inspired many fine stories that are still being told. Homer, who probably lived in Greece about 900 B.C., is now generally accepted by scholars as the author of the *Iliad* and the *Odyssey*. Homer is believed to have traveled from island to island, and from city to city, in and around Greece, reciting his poems publicly for a fee. Homer's stories later inspired the *Aeneid* of the Italian poet, Virgil (70 B.C.-19 B.C.).

The *Mahabharata*, written in Sanskrit about 200 B.C., has for its theme the career of the Pandavas, five brothers. The *Bhagavad Gita* is one of its great poetic passages describing vividly the growth of the human soul. Another great story epic from India is Valmiki's *Rama-*



L. Armstrong Roberts

#### It's Turnabout as Granddaughter Reads to Grandmother

*yana*, a romantic tale of one of the incarnations of Vishnu. This was probably written several hundred years after the *Mahabharata*.

The Buddhist *Jataka Tales*, written in Pali, a language like Sanskrit, came first from Ceylon. In these tales, Buddha recalls earlier incarnations in the forms of animals. Each tale has a moral, making them somewhat like the *Fables of Aesop*, supposed to have been written by a Greek slave in the 500's B.C. The *Jatakas* were followed about A.D. 500 by the *Panchatantra*, a collection of animal fables which did not refer to Buddha. The *Ocean of Rivers of Stories*, a large and popular collection of Indian folk tales, was transcribed in the 1000's.

The great Persian contribution to the literature of storytelling was the *Epic of Kings*, written by Firdausi in about A.D. 1000. One episode from this epic was the source of *Sohrab and Rustum*, written by Matthew Arnold in the 1800's.

The *Song of the Cid*, written by an anonymous author in the 1100's, glorifies the life and accomplishments of the Spanish ruler, Roderigo Diaz, who died in 1099.

In China, the story of *Gessar Khan* is the favorite Chinese hero tale. It is said to have come into being because Buddha showed the need for a hero to inspire the followers of his religion.

In Northern Europe, the German *Nibelungenlied* became the counterpart of the gods and goddesses conceived by the Greek poet, Homer. The *Nibelungenlied*, written between 1100 and 1300, shows many points of similarity to the Homeric tales.

The Icelandic sagas were sung and told from about 1000 to 1150. They were obviously drawn from Greek and German mythology, but were also influenced by Christianity.

It is thought that the Viking storytellers may have borrowed their literary form from the Irish. There are

## STORYTELLING

two Irish sagas. One is the Red Branch, or Ulster Cycle, with Cuchulain and Deirdre as the best known characters. The other is the Fenian Cycle, in which are told the *High Deeds of Finn*. Both were written before 1500. The Fenian Cycle is believed to be the later one, since its paganism is modified by Christian influences.

The *Mabinogion*, which, translated literally, means *youthful careers*, is a collection of Welsh stories of the 1200's and 1300's. Today this collection is popularly identified with the King Arthur stories, although it contains only three of the Arthurian romances.

The outstanding French epic of the Middle Ages is the *Song of Roland*, written about 1050. It is one of the many epics of Charlemagne, the Frankish King who was a favorite subject for French, Italian, and Spanish poets.

The Finnish epic, the *Kalevala*, was spread by storytellers for hundreds of years before part of it was published in 1826 by Zacharias Topelius. In 1835 Elias Lönnrot began going about the country talking to the peasants and taking down all that they could tell him about the traditional songs. In 1849 he published his final edition of the epic, having added 12,000 lines. The *Kalevala* is full of mythology and folk lore, and is written in the same meter that Longfellow adopted for his *Hiawatha*.

In the United States, there are two famous tales which might be classified as either hero or folk tales. One is the story of Paul Bunyan, the fabulous lumberjack. The other is the saga of Pecos Bill, the cowboy of great prowess. James C. Bowman has told the story of *Winabogo, Master of Life*. This Iroquois Indian story has more of the quality of the old hero stories, because of its philosophy and evidence of spiritual aspiration. The United States has many folk tales based on the life of the Negroes of the Southern States, the Creoles of Louisiana, and the Indians. D.E.S.

#### Books to Read

##### Collections — General

Association for Childhood Education, Literature Committee. *Told under the Blue Umbrella; Nine Stories for New Children*. Illus. by Marguerite Davis. Macmillan, 1933. Thirty-eight realistic stories that are told with imagination. Companion volumes are: *Told under the Green Umbrella; Old Stories for New Children*, 1930. Folktales in versions that are suitable for storytelling. *Told under the Stars and Stripes*. Illus. by Nedda Walker. 1945. Modern stories that illustrate a feeling of interracial harmony.

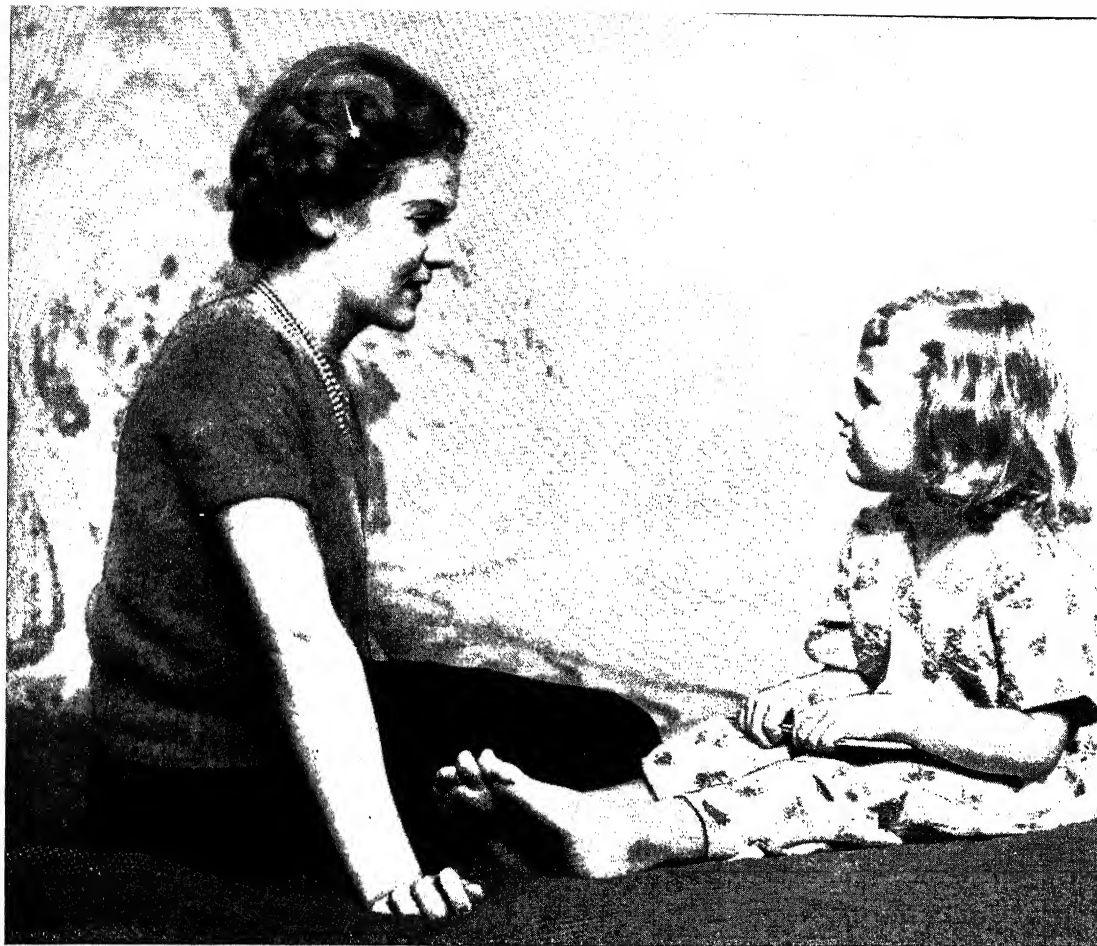
BLECKER, MARY NOEL, comp. *Big Music; or, Twenty Merry Tales to Tell*. Illus. by Louis S. Glanzman. Viking, 1946. Fine collection of stories to tell and read.

DAVIS, MARY GORDON, comp. *A Baker's Dozen; Thirteen Stories to Tell and Read Aloud*. Illus. by Emma Brock. Harcourt, 1930. Selected by a former supervisor of storytelling. *With Cap and Belly; Humorous Stories to Tell and to Read Aloud*. Illus. by Richard Bennett. 1937.

FARJEON, ELEANOR. *Italian Propprhoe and Other Tales*. Illus. by Rosalind Thornicroft. Stokes, 1926. Twenty charming stories that reflect the gaiety and sunshine of Italy.

FENNER, PHYLLIS REID, ed. *Time to Laugh; Funny Tales from Here and There*. Illus. by H.C. Pitz. Knopf, 1942. Twenty tales, old and new, that many children have enjoyed.

HARPER, WILLIAMINA, comp. *Story-Hour Favorites; Se-*



H. Armstrong Roberts

**Storytelling Is Fun at Any Time, but When the Day Is Done and It's Bedtime, That's the Best Time of All**

- lected for *Library, School, and Home Use*. Century, 1918. There are nineteen stories taken from the literature and folklore of many countries. Other compilations include: *Flying Hoofs; Stories of Horses*. Illus. by Paul Brown. Houghton, 1939. And, illus. by Wilfred Jones: *Ghosts and Goblins; Stories for Halloween and Other Times*. Dutton, 1936. *Harvest Feast; Stories of Thanksgiving, Yesterday and Today*. 1938. *Merry Christmas to You! Stories for Christmas*. 1935.
- KIPLING, RUDYARD. *Just So Stories*. Illus. by J. M. Gleeson. Doubleday, 1912. How the camel got his hump, the elephant got his trunk, the rhinoceros got his wrinkly skin, and other nonsense tales.
- LANG, ANDREW, ed. *The Blue Fairy Book*. Illus. by H. J. Ford and G. P. Jacob Hood. Longmans, 1929. Compiled by a student of folklore from the traditional literature of many peoples.
- OLCOTT, FRANCES JENKINS, ed. *Book of Elves and Fairies*. Illus. by Milo Winter. Houghton, 1918. *Good Stories for Great Holidays*. 1922. *Red Indian Fairy Book*. 1917. A former children's librarian's collection, arranged for story-telling and reading aloud, and for children's own reading.
- POWER, EFFIE LOUISE, comp. *Bag o' Tales; a Source Book for Storytellers*. Illus. by Corydon Bell. Dutton, 1934. Traditional stories from many sources, arranged in groups under such headings as: Folk Tales and Fables, Greek Myths and Epics, Ballads, Family Books. Other compilations are: *From Umar's Pack*. Illus. by Dorothy Bayley. 1937. Hero stories from many lands. *Stories to Shorten the Road*. Illus. by Dorothy Bayley. 1936. Fifteen gay folktales from the British Isles and the Continent. *Blue Caravan Tales*. Illus. by Pelagie Doane. 1935. *Little Black Sambo, The Sleeping Beauty*, and thirteen other familiar stories.
- PYLE, HOWARD, author-illustrator. *Pepper and Salt; or, Seasoning for Young Folk*. Harper, 1923. *Twilight Land*. 1904. *Wonder Clock*. 1904. Old, familiar tales retold with lightness and humor. The black and white illustrations are in the spirit of the story.
- SANDBURG, CARL. *Rootabaga Stories*. Illus. by Maud and Miska Petersham. Harcourt, 1922. Short stories by a master of American prose. They are as American as the Middle West.
- SAWYER, RUTH. *This Is the Christmas; a Serbian Folk Tale*. Horn Book, Inc., 1945. A story handed down for generations about a blind gypsy boy who became a singer for the people of Serbia.
- SMITH, ELVA SOPHRONIA, and HAZELTINE, A. I. *The Christmas Book of Legends and Stories*. Illus. by Roger Duvoisin. Lothrop, 1944. A new edition of an old stand-by, containing many new stories.
- STOCKTON, FRANK RICHARD. *Reformed Pirate*; foreword by M. G. Davis. Illus. by Reginald Birch. Scribner, 1936. *Bee-man of Orn, and Other Fanciful Tales*. 1908. Fantastic tales told with a matter-of-factness that makes them delightful.
- TAPPAN, EVA MARCH, ed. *Old Ballads in Prose*. Houghton, 1901. Aspirited retelling of twenty-two famous ballads.
- TYLER, ANNA COGSWELL, comp. *Twenty-four Unusual Stories for Boys and Girls*. Illus. by Maud and Miska Petersham. Harcourt, 1921. These tales were favorites with children in the story hours at the New York Public Library.

WATSON, KATHERINE WILLIAMS, comp. *Their Way*. Illus. by Lucille Wallower. Whitman, 1945. Short stories with a religious significance.

YOUNG, ELLA. *The Unicorn with Silver Shoes*. Illus. by Robert Lawson. Longmans, 1932. The tale of Ballor's son, who escapes into the Land of the Ever Young.

### Hero Tales and Legends

#### Arabia

TIETJENS, EUNICE STRONG HAMMOND. *Romance of Antur*. Illus. by Samuel Glanckoff. Coward-McCann, 1929. Story of the Arabian hero, Antur, warrior, lover, and poet without peer.

#### British Isles

##### England

DARTON, FREDERICK JOSEPH HARVEY. *Story of the Canterbury Pilgrims, retold from Chaucer and Others*. Illus. by M. L. Kirk. Stokes, 1914. This retelling retains the color and humor of the original.

PYLE, HOWARD, author-illustrator. *The Merry Adventures of Robin Hood of Great Renown in Nottinghamshire*. Scribner, 1933. Pyle has retold the old ballad of the outlaw of Sherwood Forest.

RIGGS, STRAFFORD. *Story of Beowulf: retold from the Ancient Epic*. Illus. by H. C. Pitz. Appleton-Century, 1933. A beautiful and dignified retelling of the old epic.

SWIFT, JONATHAN. *Gulliver's Travels*. Illus. by Arthur Rackham. Dutton, 1909. Extraordinary adventures of shipwreck, Lilliputians, and giants.

##### Ireland

COLUM, PADRAIC. *The Forge in the Forest*. Illus. by Boris Artzybasheff. Macmillan, 1925. Four men brought a wild horse to the blacksmith to be shod. He agreed to do it if they would tell a story for each of the four elements he used in his trade: earth, air, fire, and water.

HULL, ELEANOR. *Boy's Cuchulain; Heroic Legends of Ireland*. Illus. by Stephen Reid. Crowell, 1910. The story of Cuchulain, the Hound of Ulster.

STEPHENS, JAMES. *Irish Fairy Tales*. Illus. by Arthur Rackham. Macmillan, 1920. The ten legends of the origin of the Fenians.

##### Wales

MABINOGION. *Island of the Mighty; Being the Hero Stories of Celtic Britain Retold from the Mabinogion*, by Padraic Colum. Illus. by Wilfred Jones. Macmillan, 1924. Old Welsh stories, retold by a gifted teller of tales.

MALORY, THOMAS, SIR. *Boy's King Arthur*. Ed. for boys by Sidney Lanier. Illus. by N. C. Wyeth. Scribner, 1917. This version follows the original more closely than any other.

MORRIS, KENNETH (CENYDD MORUS, pseud.). *Book of the Three Dragons*. Illus. by F. H. Horvath. Longmans, 1930. A fuller account of the adventures of Manawyddan than is found in other versions of the Mabinogion.

PYLE, HOWARD, author-illustrator. *Story of King Arthur and His Knights*. Scribner, 1933. *Story of the Champions of the Round Table*. 1933. *Story of Sir Lancelot and His Companions*. 1933. *Story of The Gail and the Passing of Arthur*. 1933. In these four books, Howard Pyle has retold the Arthurian romance in rich and colorful prose. Black and white illustrations complement the text.

#### Denmark

SAXO GRAMMATICUS. *Swords of the Vikings; Stories from the Works of the Author; retold by Julia Davis Adams*. Illus. by Suzanne Lassen. Dutton, 1928. Tales of the ancient Danish heroes and demigods.

#### Finland

BALDWIN, JAMES. *Sampo; Hero Adventures of the Finnish Kalevala*. Illus. by N. C. Wyeth. Scribner, 1912. The Finnish epic retold in prose.

DEUTSCH, BARBETTE. *Heroes of the Kalevala; Finland's Saga*. Illus. by Fritz Eichenberg. Messner, 1940. A modern poet has caught the spirit and character of the original runes, and set them to fine prose.

#### France

ECHOLS, ULA WATERHOUSE. *Knights of Charlemagne*. Illus. by Henry Pitz. Longmans, 1938. Seven of the Charlemagne stories. *Song of Roland*; translated by Merriam Sherwood. Illus. by Edith Emerson. 1938. A readable version of the classic tale.

#### Germany

BALDWIN, JAMES. *Story of Siegfried*. Illus. by Peter Hurd. Scribner, 1931. A good edition of the Siegfried legends.

#### Greece

CHURCH, ALFRED JOHN. *Odyssey for Boys and Girls; told from Homer*. Macmillan, 1925. The adventures of Ulysses on his homeward voyage after the fall of Troy. *Iliad for Boys and Girls; told from Homer in Simple Language*. 1907. The principal events of the Trojan War. HOMER. *Children's Homer; the Adventures of Odysseus and the Tale of Troy*, by Padraic Colum. Illus. by Willy Pogany. Macmillan, 1918. Excellent version of tales taken from the Iliad and the Odyssey of Homer.

#### Iceland

LEIGHTON, ROBERT. *Olaf the Glorious*. Illus. by Henry Pitz. Macmillan, 1929. Icelandic sagas were the source of this dramatic story of the tenth-century King of Norway.

#### India

VALMIKI. *Rama, the Hero of India; Valmiki's Ramayana Done into a Short English Version for Boys and Girls by Dhan Gopal Mukerji*. Dutton, 1930. A beautiful retelling of this epic in vivid, rhythmic prose.

#### Japan and China

MCFEER, MAY YONGE and WARD, LIND. *Prince Bantam; Being the Adventures of Yoshitsune the Brave and His Faithful Henchman Great Benkei of the Western Pagoda*. Macmillan, 1929. Romantic legend of the Bantam Prince; his adventures in Japan before fleeing to China, where he was later known as Genghis Khan.

#### Norway and Sweden

HOSFORD, DOROTHY GRANT. *Sons of the Volsungs; adapted from Sigurd the Volsung*, by William Morris. Illus. by Frank Dobias. Macmillan, 1932. A beautiful prose version of the first two books of William Morris's *Story of Sigurd the Volsung*.

#### Persia

CHIDSEY, ALAN LAKE. *Rustam, Lion of Persia*. Illus. by Lois Lenski. Putnam, 1930. An easy to read, connected narrative, written with zest and appreciation of the heroic episodes.

GIBSON, KATHARINE. *The Golden Bird and Other Stories*. Illus. by E. G. Sommer. Macmillan, 1927. Ten legends from Egypt, Greece, Persia, China, and France. First told at the Cleveland Museum of Art.

#### Spain

EL Cid CAMPEADOR. *The Tale of the Warrior Lord; El Cantar de mio Cid*. Translated by Merriam Sherwood. Illus. by H. C. Pitz. Longmans, 1930. A fine prose version of the twelfth-century classic poem, which recounts the deeds of this Spanish hero.

IRVING, WASHINGTON. *The Alhambra, Palace of Mystery and Splendor*. Selected and rearranged by Mabel Williams. Macmillan, 1926. Irving's stories, wisely edited so as to preserve the beauty, mystery, and romance of mediaeval Spain.

#### United States

BOWMAN, JAMES CLAYD. *Pecos Bill, the Greatest Cowboy of all Time*. Illus. by Laura Bannon. Whitman, 1937. Pecos Bill is to cowboys what Paul Bunyan is to lumberjacks. *Winabobo, Master of Life*. Illus. by Armstrong Sperry. 1941. A continuous narrative based on North American Indian myths and folk tales.

MALCOLMSON, ANNE BURNETT. *Yankee Doodle's Cousins*. Illus. by Robert McCloskey. Houghton, 1941. Twenty-eight stories about real and legendary characters of American folklore.

MILLER, OLIVE KENNON BEAUPRÉ. *Heroes, Outlaws, and Funny Fellows of American Popular Tales*. Doubleday, 1939. Many of the characters are the same as those in the Malcolmson book, but most of the tales are different.

SHEPARD, ESTHER. *Paul Bunyan*. Illus. by Rockwell Kent. Harcourt, 1925. "Tall tales" of the legendary American lumberjack.

#### Folk Tales

##### Arabia

ARABIAN NIGHTS. *Thousand and One Nights; Tales of Wonder and Magnificence*; scl. and ed. by Padraic Colum. Illus. by Eric Pape. Macmillan, 1923. A fine retelling of ten of the best-known tales. *Thousand and One Nights; their Best-known Tales*. ed. by Wiggin, Kate Douglas, and Smith, Nora A. Illus. by Maxfield Parrish. Scribner, 1909. Ten of the most familiar tales of the East, carefully chosen and edited.

##### British Isles

###### England

JACOBS, JOSEPH, ed. *English Fairy Tales*. Putnam, 1904. *More English Fairy Tales*. 1923. Stories full of vigor and humor.

###### Ireland

COLUM, PADRAIC. *Boy Who Knew What the Birds Said*. Illus. by D. S. Walker. Macmillan, 1918. Eight Irish tales retold with imagination and humor.

MACMANUS, SEUMAS. *Donegal Fairy Stories*. Doubleday, 1900. Ten Irish tales retold with gusto. Other collections are: *Donegal Wonder Book*. Stokes, 1926. Eleven heroic tales told with grace and humor. *In Chimney Corners*. Illus. by P. C. Smith. Doubleday, 1899. Includes "Billy Beg and His Bull." All are told with gaiety and understanding of Irish qualities.

YEATS, WILLIAM BUTLER, ed. *Irish Fairy and Folk Tales*. Modern Library, 1918. Storytellers appreciate the source material in this collection.

YOUNG, ELLA. *Wonder Smith and His Son; a Tale from the Golden Childhood of the World*, retold. Illus. by Boris Artzybasheff. Longmans, 1927. Fourteen legends of the Gubbaun Saor (the Wonder Smith).

###### Scotland

GRIERSON, ELIZABETH WILSON. *Scottish Fairy Book*. Illus. by M. M. Williams. Stokes, 1910. A vigorous retelling of Scottish folktales and ballads.

JACOBS, JOSEPH, comp. *Celtic Fairy Tales*. Illus. by J. D. Batten. Putnam, 1923. Nine stories from the folklore of the Welsh, Scottish, and Irish Celts.

##### China

CHRISMAN, ARTHUR BOWIE. *Shen of the Sea; a Book for Children*. Illus. by Else Hasselriis. Dutton, 1925. Tales with rhythm, beauty, humor, and Eastern philosophy. Companion volumes are: *Treasure Long Hidden; Old Tales and New Tales of the East*. Illus. by Weda Yap. 1941. *Wind that Wouldn't Blow; Stories of the Merry Middle Kingdom for Children, and Myself*. Illus. by Else Hasselriis. 1927.

WU CH' ENG-EN. *Adventures of Monkey*. Adapted from the translation made from the Chinese, by Arthur Waley. Illus. by Kurt Wiese. Day, 1944. Nonsense tales which have delighted millions of Chinese children and adults for over 300 years.

##### Czechoslovakia

FILMORE, PARKER HOYSTER. *Czechoslovak Fairy Tales*. Illus. by Jan Matulka. Harcourt, 1919. Fifteen well-told folk tales.

##### Denmark

ANDERSEN, HANS CHRISTIAN. *Fairy Tales*. Illus. by Tasha Tudor. Oxford, 1945. A new edition containing

twenty-eight stories. *It's Perfectly True, and Other Stories*. Translated from the Danish by Paul Leyssac. Illus. by Richard Bennett. Harcourt, 1938. Stories translated by a Danish actor who has told them from the platform and over the radio.

##### East Indies

DE LEEUW, HENDRIK. *Peewee the Mousedeer*. Illus. by Tibor Gergely. McKay, 1943. In the East Indies, the mousedeer plays a role similar to that of the jackal or the fox in other folklore and fables.

##### Finland

BOWMAN, JAMES CLOYD and BIANCO, MARGERY. *Tales from a Finnish Tupa; from a translation by Aili Kolehmainen*. Illus. by Laura Bannon. Whitman, 1936. Folk tales and fables arranged under the headings: Tales of Magic, Droll Stories, Fables.

##### France

PERRAULT, CHARLES. *French Fairy Tales; retold with a foreword by Louis Untermeyer*. Illus. by Gustave Doré. Didier, 1946. Cinderella, Sleeping Beauty, Little Thumb, Puss-in-Boots, Riquet of the Turg, Blue Beard, The Fairy, Little Red Riding Hood. *Tales of Mother Goose; translated by Charles Welsh*. Heath, 1902. A new edition of this classic that is a valuable addition to any library.

##### Germany

GRIMM, JACOB LUDWIG KARL, and WILHELM KARL. *Household Stories; translated from the German by Lucy Crane*. Illus. by Walter Crane. Macmillan, 1925. An excellent edition of these ever-popular stories. *Tales from Grimm; Freely translated and illustrated by Wanda Gág*. Coward-McCann, 1936. Sixteen of the best-known stories translated with zest and vigor.

##### Haiti

COURLANDER, HAROLD. *Uncle Bouqui of Haiti*. Illus. by L. H. Crockett. Morrow, 1942. An amusing collection of folk tales about Uncle Bouqui, a big, black man who lived in the mountains of Haiti.

##### India

JĀTAKAS. *Jataka Tales re-told by Ellen C. Babbitt*. Illus. by Ellsworth Young. Century, 1912. *More Jataka Tales re-told by Ellen C. Babbitt*. Illus. by Ellsworth Young. 1922. Fables, chiefly about animals, taken from Hindu folklore.

##### Japan

HEARN, LAFCADIO, and Others. *Japanese Fairy Tales*. Boni and Liveright, 1924. Sixteen tales. This book will be valuable to the student of folklore.

OZAKI, YEI THEODORA. *Japanese Fairy Book*. Dutton, 1922. Complete and authoritative collection of folklore from Japan.

WILLISTON, TERESA PEIRCE. *Japanese Fairy Tales*. Illus. by S. O. Gawa. Rand, 1911. Two volumes. The first has eight stories, the second has six. They are suitable for storytelling with little or no adaptation needed on the part of the narrator.

##### Mexico

BRENNER, ANITA. *Boy who Could Do Anything, and other Mexican Folk Tales*. Illus. by Jean Charlot. Scott, 1942. Twenty-four typically Mexican folk tales.

##### Norway

THORNE-THOMSEN, GUDRUN. *East o' the Sun, and West o' the Moon, with Other Norwegian Folk Tales*. Row, 1946. One of the great storytellers of our time tells her native folk tales with spirit, rare understanding, and humor. *The Sky Bed; a Norwegian Christmas*. Illus. by Nedda Walker. Scribner, 1944. A story of Norwegian Christmas customs.

UNDSET, SIGRID, ed. *True and Untrue, and Other Norse Tales*. Illus. by Frederick T. Chapman. Knopf, 1945. Storytellers will value the chapter on the origin and characteristics of Norse folk tales. Children will love the stories.



**Poland**

BORSKI, LUCIA MERECKA, and MILLER, K. B. *Jolly Tailor, and Other Fairy Tales, tr. from the Polish.* Illus. by Kazimir Klepacki. Longmans, 1925. Ten merry Polish tales.

**Puerto Rico**

BELPRÉ, PURA. *Perez and Martina; a Porto Rican Folk Tale.* Illus. by Carlos Sanchez. Warne, 1932. The amusing story of a highly bred cockroach who married a gallant mouse, and lived happily until Perez became overgreedy. *The Tiger and the Rabbit, and Other Tales.* Illus. by Kay Peterson Parker. Houghton, 1946. Puerto Rican folk tales of kings and beautiful princesses, of animals that talk, repetitive stories, and stories of spiritual significance.

**Russia**

AFENSI'EV, ALEKSANDR NIKOLAEVICH. *Russian Fairy Tales, tr. by Norbert Guterman.* Illus. by A. Alexeieff. Pantheon, 1945. Nearly two hundred folk tales, many translated for the first time. A beautiful and valuable book, especially for the storyteller.

CARRICK, VALERY. *Picture Tales from the Russian; tr. by Nevill Forbes.* Stokes, 1920. The humor makes this book especially suitable for little children.

RANSOME, ARTHUR. *Old Peter's Russian Tales.* Nelson, 1917. Many of these twenty tales are similar to folk tales of other countries.

**South Africa**

MARAI, JOSEF. *Koos, the Hottentot; tales of the Veld.* Illus. by Henry Stahlhut. Knopf, 1945. A Hottentot told these authentic stories to the author.

**South America**

EELS, ELSIE SPICER. *Brazilian Fairy Book.* Illus. by G. W. Hood. Stokes, 1926. Ten folk tales that have probably developed from Spanish and Portuguese stories.

FINGER, CHARLES JOSEPH. *Tales from Silver Lands.* Illus. by Paul Honoré. Doubleday, 1924. Mr. Finger collected these stories as he traveled in South America.

HENIUS, FRANK, comp. *Stories from the Americas.* Illus. by Leo Politi. Scribner, 1944. Stories from twenty of the American republics "south of the border," selected by Latin Americans. Some originated in Europe; others are Indian legends.

**Spain**

GUNTHERMAN, BERTHA L., comp. *Castles in Spain, and Other Enchantments; Spanish Legends and Romances.* Illus. by Mahlon Blaine. Longmans, 1928. These legends and tales preserve the romantic atmosphere of old Spain.

SAWYER, RUTH. *Picture Tales from Spain.* Illus. by Carlos Sanchez. Stokes, 1936. Eleven folk tales delightfully retold.

**United Nations**

McEWEN, JESSIE EVELYN (AGNES FISHER, pseud.). *Once upon a Time; Folk Tales, Myths, and Legends of the United Nations.* Illus. by Zhenya Gay. Nelson, 1943. Twenty-seven tales of the supernatural, ranging in locale from Assyria to New Zealand.

**United States**

CHASE, RICHARD, ed. *Jack Tales.* Illus. by Berkeley Williams. Houghton, 1943. North Carolina folk tales about a character named Simple Jack, who always comes out on top.

HARRIS, JOEL CHANDLER. *Uncle Remus, His Songs and His Sayings.* Illus. by A. B. Frost. Appleton, 1908. These stories of Negro life on a southern plantation have become a part of the heritage of all American children.

*Nights with Uncle Remus.* Illus. by Milo Winter. Houghton, 1917.

**Indians**

EASTMAN, CHARLES ALEXANDER, and ELAINE. *Wigwam Evenings; Sioux Folk Tales Retold.* Illus. by E. W. Deming. Little, 1909. Twenty-seven short myths, fables, and fairy stories.

GILLIAM, CHARLES EDWARD. *Beyond the Clapping Mountains; Eskimo Stories from Alaska.* Illus. by Chanimum. Macmillan, 1943. An Eskimo told these humorous animal tales to the author.

GRINNELL, GEORGE BIRD. *Blackfoot Lodge Tales.* Scribner, 1904. Legends and stories as told by the Blackfoot Indians.

HILLYER, WILLIAM HURD. *Box of Daylight.* Illus. by Eric Berry. Knopf, 1931. Stories of Indians in the Canadian Northwest, based on various ancient Indian myths and legends.

JUDD, MARY CATHERINE, comp. *Wigwam Stories told by North American Indians.* Grinn, 1901. Forty-two short legends of various tribes, based on Schoolcraft. Also contains the stories used by Longfellow in writing *Hiawatha*.

LINDERMAN, FRANK BIRD. *Kootenai Why Stories.* Illus. by C. L. Bull. Scribner, 1926. Stories of birds, animals, and the out-of-doors told by a student of Indian folklore.

SCHOOLCRAFT, HENRY ROWE. *Indian Fairy Book, from the Original Legends.* Illus. by Florence Choate and Elizabeth Curtis. Stokes, 1916. This book, by the first man to study how the Indians lived and to collect their legends, remains a standard in this field.

SHEAHAN, HENRY BISTON (HENRY BISTON, pseud.). *Sons of Kai; the Story the Indian Told.* Macmillan, 1926. A Navaho Indian legend that tells how the twin sons of Kai learned the Song of Healing.

ZEPKATA-SA. *Old Indian Legends.* Ginn, 1901. Short tales told by the Dakota Indians.

**Poetry**

ADAMS, FLORENCE ANN, & McCARRICK, ELIZABETH. *Highdays and Holidays.* Illus. by E. L. Brock. Dutton, 1927. Poems for twenty-one American holidays.

Association for Childhood Education. Literature Committee. *Sung Under the Silver Umbrella; Poems for Younger Children.* Macmillan, 1935. A collection of about two hundred poems, many that have stood the test of time, others by contemporary poets.

AUSTIN, MARY HUNTER. *Children Sing in the Far West.* Illus. by Gerald Cassidy. Houghton, 1928. Poems about the beauty and romance of the West.

BENET, ROSEMARY CARR, and STEPHEN VINCENT. *Book of Americans.* Illus. by Charles Child. Farrar, 1933. Famous Americans from Columbus to Woodrow Wilson portrayed in vigorous, free-swinging verse.

BENET, WILLIAM ROSI, comp. *Poems for Youth; an American Anthology.* Dutton, 1925.

BONTEMPS, ARNA WENDELL, comp. *Golden Slippers; an Anthology of Negro Poetry for Young Readers.* Illus. by H. B. Sharon. Harper, 1941. There are religious, humorous, lyrical, and narrative poems, many not in dialect.

BROWNING, ROBERT. *Pied Piper of Hamelin.* Illus. by Kate Greenaway. Warne, 1910. A charming edition of this classic.

DAVIS, MARY GOULD, comp. *Girl's Book of Verse; a Treasury of Old and New Poems; with an Introduction by Dorothy Canfield Fisher.* Stokes, 1922. The poems are grouped under the headings: Melody, Pipes of Pan, Enchantments, Stories.

FERRIS, HILIN JOSEPHINE, comp. *Love's Enchantment; Story Poems and Ballads.* Decorations by Vera Brock. Doubleday, 1944. Seventy-seven romantic poems that are good for reading aloud.

FIELD, EUGENE. *Poems of Childhood.* Illus. by Maxfield Parrish. Scribner, 1904. Contains the old favorites: "The Duel"; "Wynken, Blynken, and Nod"; "Little Boy Blue." An attractive edition with pictures that have become famous.

FISH, HELEN DEAN, comp. *Boy's Book of Verse; a Treasury of Old and New Poems.* Stokes,

FYLEMAN, ROSE, ed. *Pipe and Drum*. Stokes, 1940. Fyleman's poetry is popular among children, especially the younger ones.

HARRINGTON, MILDRED P., comp. *Ring-a-Round; a Collection of Verse for Boys and Girls*. Illus. by Corydon Bell. Macmillan, 1930. A children's librarian selected these poems for her nieces and nephews, and their father illustrated the book.

LINDSAY, VACHEL. *Johnny Appleseed, and other Poems*. Illus. by George Richards. Macmillan, 1928. A representative collection arranged under four headings: Yellow Butterflies, Moon Poems, Stories and Heroes, Nightingales.

LONGFELLOW, HENRY WADSWORTH. *Children's Own Longfellow*. Houghton, 1920. Six complete poems and parts of two others: *Evangeline* and *Hiawatha*. Song of *Hiawatha*. Illus. by Frederic Remington. Houghton, 1891. The complete poem, based on the American Indian legend.

MILLAY, EDNA ST. VINCENT. *Poems selected for Young People*. Illus. by J. Paget-Fredericks. Harper, 1929. An excellent collection from the author's books, and seven poems never before published.

OLCOTT, FRANCES JENKINS, comp. *Story-Telling Poems*. Houghton, 1913. *Story-Telling Ballads*. Illus. by Milo Winter, 1920. Both books are well-edited and have been used by storytellers for a generation.

SANDBURG, CARL. *Early Moon*. Illus. by James Daugherty. Harcourt, 1930. Seventy poems grouped under the headings: Pictures of Today, Children, Wind and the Sea, Portraits, Birds and Bugs, Night, End Thoughts.

TEASDALE, SARA, comp. *Rainbow Gold; Poems Old and New; selected for Boys and Girls*. Illus. by Dugald Walker. Macmillan, 1922. Selections from the Works of Shakespeare, Shelley, Black, Tennyson, Rossetti, Longfellow, and such moderns as Vachel Lindsay, Walter de la Mare, Alfred Noyes, and Hilda Conkling.

UTERMEYER, LOUIS, ed. *Rainbow in the Sky*. Illus. by Reginald Birch. Harcourt, 1935. *Stars to Steer By*. Illus. by Dorothy Bayley. 1941. *This Singing World*. 1923. These three volumes are treasure houses of fine poetry.

WIGGIN, KATE DOUGLAS SMITH, and SMITH, NORA A., eds. *Golden Numbers*. Doubleday, 1902. *Pinafore Palace*. 1907. *Posy Ring*. 1903. These three have been standbys for nearly half a century.

WOOD, RAY, comp. *American Mother Goose, with a foreword by John A. Lomax*. Illus. by Ed Hargis. Stokes, 1940. Children's rhymes, game songs, counting songs, nonsense jingles—all with an American tang.

See also the Bibliography with the article LITERATURE FOR CHILDREN.

**Related Subjects.** The reader is also referred to:

Ballad	Fairy
Bible (Bible for Children's Use)	Folklore
Fable	Literature for Children
	Myth

#### FAMOUS CHARACTERS AND STORIES

Aeneid	Gulliver's Travels
Amadis of Gaul	Hiawatha
Arabian Nights	Iliad
Arthur, King	Lancelot
Canterbury Tales	Lochinvar
Cinderella	Mother Goose
Courtship of Miles Standish	Nibelungenlied
Cuchulainn	Odyssey
Don Quixote	Peter Pan
Evangeline	Rip Van Winkle
Galahad, Sir	Robin Hood
Grimm's Fairy Tales	Robinson Crusoe
	Round Table
	Santa Claus

**STOSS**, *shtohs*, **VEIT** (1440?-1533), was a German sculptor who was noted for his wood carvings. Most of his works were religious, and were placed in cathedrals and public buildings throughout Germany. Stoss was one of the most important sculptors of the Gothic period, but his work marks the beginning of the Renaissance.

Little is known about his life, but it is believed that he was born and educated in Nürnberg. From 1477 to 1496 he worked in Kracow, Poland, and afterward returned to Nürnberg. F.Ho.

**STOUT.** See BEER.

**STOUT INSTITUTE** is a coeducational, state-supported teachers' college in Menomonie, Wis. It prepares teachers for industrial, vocational, and home-economics education. Courses offered lead to B.S. and M.S. degrees. The school was established in 1903, and first offered graduate work in 1927. Its average enrollment is about 600. B.E.N.

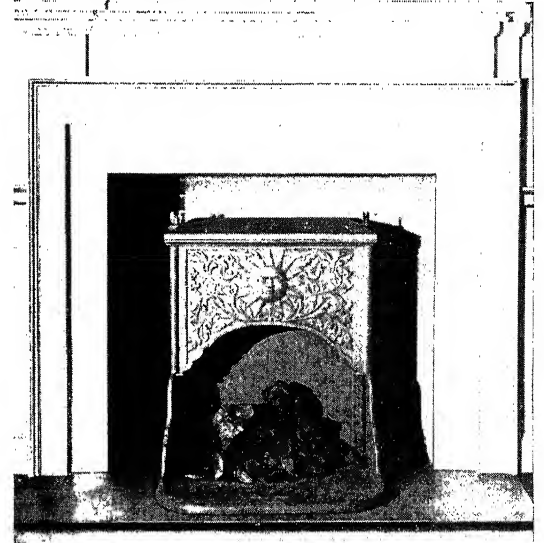
**STOVAINE**, *STO vayn*. See ANESTHESIA.

**STOVARSOL**, *stoh VAHR sahl*, a drug. See DYSENTERY.

**STOVE.** The first stoves were probably made in Alsace, France, in 1490. These stoves were made of brick and tile, like many of the stoves in Europe today. They had no handy means of getting rid of the ashes resulting from a fire. The wood used as fuel was placed in an opening at the top, which was covered by a lid.

The early stoves were so unsatisfactory that for nearly two hundred years most persons continued to use the fireplace for cooking and heating. The first stoves produced in the United States were made at Lynn, Mass., in 1642. They were little more than cast-iron boxes fitted with lids.

The Franklin stove was invented by Benjamin Franklin in 1744. This cast-iron stove was built into the wall like a fireplace, but extended out into the room so that there were three sides to give off heat.



Gladys Muller, Museum of The Franklin Institute

**The Franklin Stove**, invented by Benjamin Franklin, made use of the fireplace, but warmed a room much better because of its larger heat-radiating surfaces.

**Heating Stoves.** At first, stoves were separated into special types for heating and others for cooking. About 1800, Isaac Orr, of Philadelphia, made the first round heating stoves. These stoves had grates through which the ashes could be shaken, and openings through which the supply of air reaching the fire could be controlled.

Wood was the most common stove fuel until the development of the base-burner, which was patented by Jordan L. Mott of New York in 1833. The base-burner was filled with coal from the top, and was arranged so that only a small amount of coal would be fed to the fire as required. The base-burner also made full use of the principles of radiation and convection in spreading heat over a wide area. See HEAT (How Heat Travels). Many principles of the early base burner are still used in the modern "parlor heaters" which heat small homes quite well, especially if the house is well insulated.

Very few changes in basic design have been made since the early appearance of coal stoves. Recent developments, however, have produced stoves which can burn even the poorest grades of bituminous coal without any objectionable smoke.

Kerosene and oil heating stoves also were developed during the 1800's, but they never proved as popular as coal heating stoves, except in rural areas. Electric stoves have been developed for small homes, and electric heaters are widely used to heat single rooms in homes where the central heating system does not operate efficiently in very cold weather.

Central heating, provided by warm-air furnaces or steam boilers, has taken the place of the heating stove in most houses and buildings. See FURNACE.

**Cooking Stoves.** The coal range was developed when the round stove of the 1800's made it necessary to have another stove for cooking purposes. From the first, these cast-iron ranges had cooking plates and an oven for baking. Many of them also had a reservoir for keeping rain water warm.

The first oil stoves were like large lamps, with one wick and a metal plate over the flame for holding a single pot or pan. Later these stoves were made with three or more burners and a larger fuel tank. Naphtha stoves were developed which turned the naphtha into vapor and mixed it with air to produce a hot flame.

Gas stoves came into common use in the United States in about 1860. Natural gas, coal gas, or a mixture of the two was fed into a burner ring which had tiny holes. Gas-flame heat was found to be quick, clean, and fairly cheap. Modern improvements in the gas range include pilot lighters which will start the stove without a match, automatic shutoffs which will turn the stove off when food has cooked long enough, controls to provide the right cooking temperature for particular foods, and insulated ovens which hold the heat.

Electric ranges were generally introduced into homes and restaurants in the United States during the 1900's. The cooking unit is a coil of some metal that is a non-conductor of electricity. At first, electric stoves had only one heat stage, and cooked food slowly in comparison to gas ranges. But the modern electric range has three or more heat stages, and cooks food in about the same time as the gas flame.

See also HEATING (with list).

A.P.K.

## STOWE, HARRIET ELIZABETH BEECHER (1811-1896),

wrote *Uncle Tom's Cabin*, the book which did much to stir up antislavery feeling. Until it was published, the quarrel between the Northern and Southern States had



Brown Bros.

Harriet Beecher Stowe,  
American writer of novels

*Uncle Tom's Cabin* turned it into a moral question as well. The argument was no longer one only of "states' rights." Harriet Beecher Stowe's novel made the North ready to fight to wipe out the terrible crime of slavery. President Abraham Lincoln recognized the part her book had played in bringing on the War between the States. When he met Harriet Beecher Stowe for the first time he said, "So this is the

little woman who made the big war."

*Uncle Tom's Cabin* was such a powerful political force that it is hard to consider the work as literature. The book was hurriedly written, but it had a lively narrative style and some excellent character portrayals. Today the book is more noted for its characters than its subject, for these characters have become part of American folklore. Every American, whether he has read the book or not, knows about Little Eva and Topsy, and the brutal overseer Simon Legree has become the most famous American villain.

Harriet Beecher Stowe was born and educated in Litchfield, Conn. The famous preacher, Henry Ward Beecher, was her brother. Her family later moved to Boston and then to Cincinnati, where her father was president of the newly established Lane Theological Seminary. In 1836 she married Calvin E. Stowe, a professor at the Seminary. In Ohio she had an opportunity to see many slaves escape to freedom across the Ohio River, which was the dividing line between free and slave soil. She also visited homes in Kentucky, where she witnessed some of the scenes described in *Uncle Tom's Cabin*. In 1850 she and her husband moved to Brunswick, Me., and here Harriet Beecher Stowe determined to write a book which would show how terrible slavery was. *Uncle Tom's Cabin* was first published serially in the *National Era*, an antislavery paper. It was published in book form in 1852 and became an immediate success.

Harriet Beecher Stowe visited England the next year and made many speeches against slavery. In 1856 she wrote another book on the subject, *Dr. A Tale of the Great Dismal Swamp*. In England Harriet Beecher Stowe had become friendly with Lady Byron, and in 1869 she published an article accusing Lord Byron of scandalous behavior. For the second time in her life Harriet Beecher Stowe caused a sensation. She continued to write and published a book almost every year for nearly thirty years.

L.J.

See also ABOLITIONIST.

**Her Works** include *The Minister's Wooing*; *The Pearl of*

**STRABISMUS**, *strah BIZ mus*. See CROSS-EYE; SQUINT.

**STRABO**, *STRA boh* (63 B.C.-A.D. 24?), was a Greek geographer and historian, known for his seventeen-volume *Geography*. The first two books of his work deal with physical geography, the next eight with Europe, six with Asia, and one with Africa. Strabo also wrote a history which is now lost. This work was made up of forty-three books and covered the period from 146 to 30 B.C. It was much used by other ancient historians. Strabo was born in Amasia, Pontus, but moved to Rome when he was about thirty-five years old. He traveled widely in Arabia, southern Europe, and northern Africa, gathering material for his books. J.W.S.W.

**STRACHAN**, *strawn*, **JOHN** (1778-1867). See CANADIAN LITERATURE (History of English-Canadian Literature [Period of Political Writings]).

**STRACHEY**, *STRA chih*, **LYTTON** (1880-1932), was an English author who wrote a distinctively new type of biography. He became famous in 1918 when his *Eminent Victorians* was published. His new style of biography was written in the form of a novel. It omitted all dull and ordinary facts, and the historical facts which were used as a basis were organized according to a well-designed dramatic pattern. Strachey also recorded the thoughts and feelings his characters may have had as well as their actions and expressions.

Lytton Strachey was born in London, the son of Lieutenant General Sir Richard Strachey, an administrator in India. As a student at Trinity College, Cambridge University, Strachey wrote poems for his school magazines. G.E.B.

His Works include *Landmarks in French Literature*;

*Queen Victoria; Books and Characters; Pope; Elizabeth and Essex; and Portraits in Miniature.*

**STRADIVARI**, *STRAH dee VAH ree*, **ANTONIO** (1644-1737), in Latin, ANTONIUS STRADIVARIUS, was one of the greatest violin makers of all time. He was born at Cremona, Italy, and as a boy worked for Nicolò Amati, the famous master of violin making. In 1690 Stradivari began to make violins under his own label. His instruments reached the height of perfection between 1700 and 1715. They were not only brilliant in tone and power, but had excellent form and were exact in every detail. Prices on genuine Stradivari violins now range from about \$10,000 to \$80,000.

At the time of his death, many unfinished instruments were found in his workshop. These were completed by either his sons or his pupils, but his name appeared on the labels. Unsuspecting purchasers have been deceived into buying instruments which have the outward appearance of his violins. But there are very few genuine specimens which remain of the about 1,500 instruments, including 125 violas and cellos, which he made. G.B.

See also AMATI; VIOLIN.

**STRAFFORD**, *STRAF erd*, **THOMAS WENTWORTH, EARL OF** (1593-1641), was an English statesman who was put to death by order of Charles I. He was born in London and was educated at Cambridge University. In 1614 he was elected to Parliament, and by 1628 was one of its leaders. He believed in a strong king and did not want to see too much power in the hands of the Parliament. In 1633 he was appointed Lord Deputy of Ireland. There his harsh rule won him the hatred of the people. But his administration was efficient, and from



Culver

Stradivari at Work on a Violin in the early 1700's. This Italian made such perfect violins that today they are worth

many thousands of dollars. It is the ambition of almost every concert violinist to own a Stradivari instrument.

## STRAIGHT BILL OF LADING

the English point of view was a very successful one.

Strafford returned to England in 1639. The king created him Earl of Strafford and began to seek his advice on state affairs. When the Presbyterians of Scotland became troublesome, King Charles asked Strafford for help. Strafford advised him to raise a body of Irish troops and use them against the Presbyterians. Strafford returned to Ireland to make preparations for subduing the Presbyterians in Scotland.

The Long Parliament met in 1640. It was at once decided to impeach Strafford for his administration of Ireland. The king called him back to London, with the royal promise that he would not be harmed "in life, honor, or fortune." It was found that there was not enough evidence to impeach Strafford for his conduct in Ireland. So Parliament dropped the impeachment plans and passed a bill of attainder, which accused Strafford of treason. Strafford released Charles from his promise. The treacherous king signed his death warrant on May 10. Two days later, Strafford was executed. He died bravely. A.M.

**STRAIGHT BILL OF LADING.** See BILL OF LADING.

**STRAIGHT TICKET.** See AUSTRALIAN BALLOT.

**STRAIN,** in surgery. See SPRAIN.

**STRAIT.** For individual straits, see specific name in THE WORLD BOOK ENCYCLOPEDIA. For example, STRAIT OF GIBRALTAR. See GIBRALTAR, STRAIT OF.

**STRAITS SETTLEMENTS.** The Straits Settlements are British colonial possessions in the southwestern region of the Malay Peninsula. They are part of British Malay. The group includes the settlements of Singapore (including Cocos and Christmas islands) and Malacca in the south, and Penang, Wellesley, and Dindings in the north. Great Britain captured the settlements from the Dutch in 1795. In 1900 Christmas Island was brought under British control, and Cocos Island was added to the settlements in 1903. The Straits Settlements are named after the Strait of Malacca, which separates the Malay Peninsula from Sumatra.

The Straits Settlements cover an area of 1,356 square miles, and have a population of 1,435,895. There is a European population of 18,101, and the rest of the people are Chinese, Malays, and natives of India.

The island of Singapore lies less than a mile from the southern tip of the Malay Peninsula, and seventy-five miles from the equator. Penang settlement is made up of a group of islands which lie off the western coast of

## STRATFORD-ON-AVON

the peninsula. These include Penang Island, the province of Wellesley, and the Dindings Islands. Penang is mostly jungle land, but some sections have been cleared for farming.

Malacca settlement is on the western coast of the peninsula, between Penang and Singapore. The island of Labuan lies off the northern coast of Borneo.

During World War II, Japanese troops occupied the British naval base at Penang on December 19, 1941. The Japanese captured Malacca on January 15, 1942. By the end of January, the invaders reached the tip of the Malay Peninsula. On February 15, 1942, Singapore fell to Japan, and the Allies lost their most important defense base in the Far East. Great Britain regained its Strait Settlements after the Allies defeated Japan.

See also MALACCA; SINGAPORE.

E.E.Et.

**STRAMONIUM,** *strah MO nih um*, is a poisonous weed of the nightshade family. Its leaves and seeds are used in medicines. This weed is also known as *Jimson weed*, *devil's-trumpet*, *stinkweed*, and *thorn apple*. It is found in the warmer parts of the world, and grows in abundance in fields and wastelands. Stramonium has a strong, unpleasant odor. It has a yellow-green stem that often grows as high as five feet. Its flowers are either white or violet and are shaped like trumpets. It has large, smooth green leaves that have sharp points and may grow from three to eight inches in length. The seeds are tiny and black and are contained in prickly burlike pods. Both the leaves and seeds are used in making the drug which is also known as stramonium.

The stramonium drug is used mainly for the relief of asthma. It is similar to the drug belladonna in that it acts as a narcotic. The leaves are burned and the smoke is inhaled in cases of asthma. Stramonium is also used in treating hemorrhoids, muscular rheumatism, and cramps. See also JIMSON WEED. H.N.M.

**Classification.** Stramonium belongs to the family *Solanaceae*. The white-flowered form is *Datura stramonium* and the violet-flowered one is *D. stramonium* var. *tatula*.

**STRANGLES.** See DISTEMPER.

**STRANGULATION.** See HERNIA.

**STRASBOURG.** See FRANCE (Cities).

**STRASBOURG,** *strahs BOOR*, or *STRASburg*, **CLOCK.** See CLOCK (Striking Clocks; illustration).

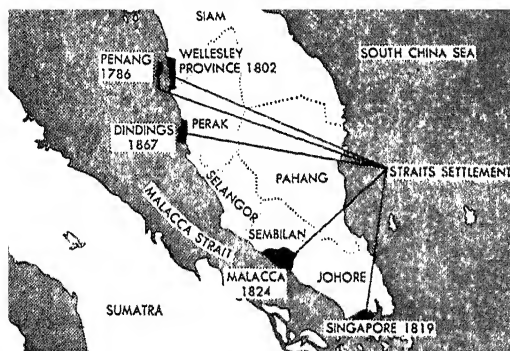
**STRASS,** *strax*. See GEM (Imitation and Artificial Gems).

**STRATEGY.** See ARMY (Elements of Military Training).

**STRATFORD-ON-AVON** (population 11,616) is a quiet English market town. It has become world-famous as the birthplace of William Shakespeare, England's greatest poet and playwright. Each year tourists from many countries walk through its cobblestone streets to visit the house where Shakespeare was born and spent his boyhood.

Stratford-on-Avon is one of the oldest towns in England. It lies in the green valley of the Avon River, eight miles southwest of Warwick. Most of the town is on the west bank of the river. Its architecture is in the old English style. The narrow shady streets are lined with high-peaked houses. Many of the gabled windows have heavily leaded panes.

The house where Shakespeare was born has been



Location Map of the Straits Settlements



## STRATOSPHERE

56,046 ft.

Altitude record of  
airplane with  
pressure cabin

42,000 ft.

Ceiling of human  
endurance with  
oxygen equipmentBeginning of  
Stratosphere

EFFECTS OF STRATOSPHERE ON MAN

Using only oxygen equipment (no pressure cabin) man cannot function above 42,000 feet. The extreme cold of the stratosphere (from  $-48^{\circ}\text{F.}$  to  $-90^{\circ}\text{F.}$ ) slows up body activity.

## TROPOSPHERE

## EARTH

kept as a memorial. It is always open to visitors. At Shottery, a mile west of Stratford, is the thatched-roof cottage which was the home of Anne Hathaway, Shakespeare's wife. The Guild Hall and Grammar School are kept as they were in Shakespeare's day. Visitors to the Shakespearean memorials also go to near-by Wilncote to see the cottage of Mary Arden, Shakespeare's mother. Another favorite tourist spot is the chance of Holy Trinity Church, where Shakespeare and his wife are buried.

In 1879 a Shakespeare Memorial was completed on the riverbank above the church. It includes a theater, a museum, and a library which contains valuable books and manuscripts having to do with Shakespeare and his life. The theater burned in 1926, but people immediately donated funds for its rebuilding. The new theater seats about 1,000 persons.

Each summer a Shakespeare festival is held in Stratford. England's leading actors perform many of Shakespeare's plays. At first the festival lasted only a week, but it became so popular that it was gradually lengthened to ten weeks. American tourists gave funds for the building of a memorial fountain and a clock tower. See also SHAKESPEARE, WILLIAM (illustrations). F.I.L.H.

**STRATHCONA AND MOUNT ROYAL, DONALD ALEXANDER SMITH, BARON** (1820-1914), was a Canadian fur trader, railroad builder, financier, and statesman. His career was closely interwoven with Canada's industrial growth. His youth and middle age were devoted to the service of the Hudson's Bay Company and the building of the Northwest. He was fifty when he held his first political office, and at sixty he became the chief promoter of the Canadian Pacific Railway. At seventy-six he accepted the office of Canadian High Commissioner to Great Britain, and for nearly ten years

more he served his country with great ability.

Smith was born at Forres, Morayshire, Scotland, and went to Canada when he was eighteen to work for the Hudson's Bay Company. He was stationed first in Labrador, and then in the Canadian Northwest. He finally became governor of the company in 1889.

When Manitoba was organized as a province, Smith was elected to the Manitoba assembly as a Conservative. The next year he was appointed commissioner for the Northwest Territories and elected to the Dominion House of Commons. He resigned from the assembly in 1874, but remained in Parliament until 1880. From 1887 to 1896, he again served in Parliament. H.U.F.

**STRATIFICATION.** See GEOLOGY (Terms [Bed]).

**STRATIFIED ROCK** consists of layers, or *strata*. Each individual layer is called a *stratum*. Most sedimentary rocks, such as shale, sandstone, conglomerate, and limestone, are stratified. Originally all strata were more or less horizontal. But folding of the earth's crust in many places has thrown the rocks out of their former position. The angle at which these layers incline to the horizontal plane is called the *dip*. The dip may vary from 0 degrees to 90 degrees (vertical). See also SEDIMENTARY ROCK. W.H.Bu.

**STRATIGRAPHY**, *strah TIG rah fih*. See ARCHAEOLOGY (Interpreting the Materials).

**STRATOCRUISER.** See AIRPLANE (Types of Civilian Planes).

**STRATOSPHERE** is the upper part of the atmosphere, or the blanket of air which surrounds the earth. The stratosphere begins about six miles above the surface of the earth in the regions near the poles, and nine or more miles above it over the equator. This layer of air is thin, or rarefied, and is of unknown depth. It is sometimes called the *isothermal region* because its temperature

remains almost always the same — around — 60° F. in polar regions and — 90° F. in the tropics. Clouds of water never form in this belt. There is practically no convection (rising of warmer air), and thus the stratosphere has almost no air currents.

Scientists are constantly seeking information about the stratosphere. Albert W. Stevens and Orvil A. Anderson in 1935 ascended in a balloon to a height of 72,395 feet, or more than thirteen miles. Research also has been done by unmanned balloons containing instruments, which have been sent up as high as 100,000 feet. E.S.S.

See also AIR; BALLOON (Balloon Explorations of the Stratosphere).

**STRATOVISION.** See TELEVISION (Technical Problems).

**STRATTON, CHARLES SHERWOOD** (1838-1883), was a midget. The American showman Phineas T. Barnum made Stratton famous as "General Tom Thumb." Stratton was born at Bridgeport, Conn. His family was of normal size but he stopped growing as a small baby. Until his early teens he was only twenty-five inches tall and weighed only fifteen pounds. Later he grew to be forty inches tall and to weigh seventy pounds.

In 1842 Barnum persuaded Stratton's parents to let the child join Barnum's show. Barnum taught him to sing and dance and tell stories, and he immediately became popular in New York City. In 1844 Barnum took him to Europe, where he entertained Queen Victoria of Great Britain and King Louis Philippe of France. Stratton traveled in America and Europe until about 1872. In 1863 he married Lavinia Warren (1841-1919), another of Barnum's midgets. F.B.K.

**STRATTON, DOROTHY CONSTANCE** (1899- ), is an American educator. During World War II, she directed the SPARS, the Women's Reserve of the United States Coast Guard. She was born at Brookfield, Mo., and was educated at Ottawa University. She taught in high schools until 1933 when she became associate professor of psychology and dean of women at Purdue University. See also SPARS.

**Her Works** include *Your Best Foot Forward*.

**STRATUM, STRA tum.** See GEOLOGY (Terms [Bed]).

**STRATUS, STRA tus,** a kind of cloud. See CLOUD (Every Cloud Has a Name; illustrations).

**STRAUS, strous, NATHAN** (1848-1931), was an American philanthropist, Zionist, and a pioneer in public health. He was born in Otterberg, Germany, and was brought to the United States when he was six years old. From 1888 to 1914, he was a partner in the New York City department store of R. H. Macy & Company. In 1892 he led a campaign in New York City for pasteurizing milk. This led to pasteurization laws in most cities.

In the last twenty years of his life, Straus gave most of his fortune to the development of Palestine. The many health projects he established there include the great Nathan and Lena Straus Health Centers in Jerusalem and Tel Aviv. He was a brother of Oscar Solomon Straus. I.J.R.

**STRAUS, OSCAR SOLOMON** (1850-1926), was an American diplomat. He was born in Otterberg, Germany and was brought to the United States when he was four years old. Straus was educated at Columbia

University and Columbia Law School and for a time practiced law. Later he worked in the department store which his father and brother had founded in New York City.



Brown Bros.

**Oscar Straus** was an American diplomat who worked for world peace.

From 1887 to 1889 and 1898 to 1900 Straus was Minister to Turkey. In 1902 he was appointed to the Permanent Court of Arbitration at The Hague. President Theodore Roosevelt appointed him Secretary of Commerce and Labor in 1906 and in 1909 Straus returned to Turkey as ambassador. E.E.Ro.

**STRAUS, OSKAR** (1870- ), is a Viennese composer of light operas. His best-known work is probably

*The Chocolate Soldier*, based on George Bernard Shaw's play *Arms and the Man*. Straus was born in Vienna, and studied composition there and in Berlin. From 1895 to 1900, he conducted theater orchestras in Berlin, Brünn, Teplitz, and Mainz. In 1910 he became conductor for E. von Wolzogen's variety theater Überbrettl in Berlin, and wrote several musical farces for it. In 1927, Straus left Berlin and worked in Vienna, Paris, and the United States. G.B.

**His Works** include, besides many operettas, an overture; a violin sonata; suites for string orchestras; and many violin, violoncello, and piano pieces.

**STRAUSS, JOHANN, and JOHANN, JR.,** were Austrian composers, father and son. They are famous for the beautiful waltzes which they wrote.

**Johann Strauss** (1804-1849) was born in Vienna, where he became an orchestra conductor in 1825. Ten years later he was appointed dance music director at the emperor's court. He was the first person to write dance music, especially waltzes, on an artistic level, and he became known as "Father of the waltz." His compositions include more than 150 waltzes, including *Songs of the Danube*. He also wrote polkas, quadrilles, and marches.



One of a series of events in the lives of immortal composers, painted for the Mazarin collection by Walter Richards

**Johann Strauss the Younger and His Orchestra** brought the gaiety of Old Vienna to all Europe, and, later, to America. The Waltz King looked the part with his proud bearing, flowing hair, curling mustache, and bushy sideburns.

**Johann Strauss, Jr.** (1825-1899), son of Johann Strauss, was born in Vienna. He became known as the "king of the waltz" because of his beautiful dance compositions. His father bitterly opposed young Strauss's ambition to be a musician, but the youth studied the violin secretly. When he was nineteen years old, he left home to conduct his own orchestra in a restaurant in Hietzing, Austria. There he began to play his own compositions, mainly waltzes.

In 1849, after his father's death, he united his own orchestra with his father's, and began a series of European tours. Everywhere the grace and beauty of his original dance music was praised. In 1855 he became conductor of summer concerts in Saint Petersburg (now Leningrad), Russia. In 1862, when he married Henrietta Treffitz, he turned his orchestra over to his brothers, Josef (1827-1870), and Eduard (1835-1916), who were also composers of dance music. Johann, Jr., composed some of his greatest waltzes after his marriage. From 1863 to 1870 he was conductor of the Russian court balls. In 1872 he conducted a series of concerts in Boston and New York City. He spent his last days in Vienna.

The most famous of Strauss's dance compositions, which number almost 500, include "On the Beautiful Blue Danube," "Tales from the Vienna Woods," "Emperor Waltz," "Artist's Life," "Vienna Blood," "Thousand and One Nights," and "Wine, Women, and Song." He also composed several successful operettas, including *Die Fledermaus* (The Bat), and *The Gypsy Baron*. G.B.

**STRAUSS, JOSEPH BAERMANN** (1870-1938), was an American engineer. He is noted for the long-span suspension bridges which he built. These include the George Washington Memorial Bridge across the Hudson River in New York City and the Golden Gate Bridge in San Francisco, Calif.

**STRAUSS, RICHARD** (1864- ), is the composer of some of the most colorful dramatic music ever written. He was born in Munich, Germany and was educated at the University of Munich. His father, Franz Strauss (1822-1905), was one of Germany's greatest horn players. Richard began to study the piano at the age of four. By the time he was six he was already composing, and before he was sixteen years old, he had completed a symphony.



**Richard Strauss**, modern German composer, was famous for his dramatic music.

In 1885 Strauss followed Hans von Bülow as conductor of the Meiningen Orchestra. Alexander Ritter, a member of that famous orchestra, urged Strauss to take up the composition of program music, in which the music expresses an idea or story. Strauss soon resigned his position and went to Italy to study. Between 1887 and 1904, he produced some of his greatest music, such as the tone poems *Macbeth*, *Don Juan*, *Till Eulenspiegel's Merry Pranks*, and *Don Quixote*, and the *Domestic Symphony*. A storm of criticism followed the performance of these works, for in them Strauss had broken many time-honored traditions of music.

In 1905 Strauss produced his first successful opera,

*Salome*. This is a one-act work based on Oscar Wilde's dramatization of the famous Biblical story. At first opera companies refused to play it, because they considered it immoral. Finally the Dresden Opera accepted it, and the opera was a brilliant success. Strauss's next opera, *Elektra*, was introduced in 1909. Two years later, *Der Rosenkavalier*, perhaps his greatest opera, was produced in Dresden. Throughout his career, Strauss showed himself a master of lyric music, and his songs, or *lieder*, rank with the best.

From 1889 to 1894, Strauss was court conductor at Munich, and for the next four years he conducted at Weimar. In 1898 he became leader of the Berlin Opera, and remained there until 1919. Then he served as director of the Vienna State Opera until 1924. Meanwhile, in 1921, he toured the United States where he conducted several orchestras. From 1933 to 1935 he was president of the German government's music department. See also EULENSPIEGEL, TILL. G.B.

His **Works** include the tone poems *Death and Transfiguration*, *A Hero's Life*, and *Thus Spake Zarathustra*; the songs "All Soul's Day," "The Poet's Eventide Walk," "Dream Twilight," "To My Son," "Morning," and "Cécilie"; and ballets, symphonies, chamber music, and choral works.

**STRAVINSKY, strah VIN skee, IGOR FËDOROVICH** (1882- ), has had greater influence on the development of modern musical composition than perhaps any other composer. His experiments in harmony have been widely imitated and discussed.

Stravinsky was born in Saint Petersburg (now Leningrad), Russia, the son of a singer at the Imperial Opera. His musical training began at the age of nine when he started to study piano. He was educated to become a lawyer, but at the age of nineteen he began to study under Nikolai Rimski-Korsakov, and decided to be a composer. In the early stages of his career, Stravinsky wrote music in the traditional manner. But by the time he wrote his ballet *The Fire Bird* he had adopted a new style with almost unheard-of discordant tones. *The Fire Bird* caused a sensation when it was produced in Paris in 1910.



Schaal, Pix

**Igor Stravinsky**, Russian composer who created a new kind of symphonic music

Stravinsky went further in his experiments in ultra-modern harmony and orchestration in *Petrouchka* (1911) and still further in *The Rite of Spring*. This ballet started a riot at its première in Paris in 1913. In later years Stravinsky experimented with various forms and combinations of voices and instruments in such works as *Les Noces*, *Histoire du Soldat*, and *Symphony of Psalms*. This last work was written to celebrate the fiftieth anniversary of the Boston Symphony Orchestra. In 1940 Stravinsky wrote a symphony in honor of the fiftieth anniversary of the Chicago Symphony Orchestra, and in 1945 composed *Scènes de Ballet* to celebrate his becoming a United States citizen. F.B.

**STRAW.** Straw consists of the dried stems of such grains as wheat, rye, oats, and barley. Straw has many different uses. On the farm, it is used as bedding for animals, and as a fertilizer. In the factory, it is used to make hats, baskets, saddles, bottle covers, paper, suitcases, and strawboard for mounting and binding. In the chemical laboratory, straw is used to produce carbon, phenol oil, pitch, and acetic acid.

Wheat straw is the best straw for hatmaking. The stems are pulled out of the ground, cut into short lengths, and laid in the sun. The sun bleaches the straw almost white. The outer layer of the straw is then stripped off, and the inside is bleached again with sulfur. The straw is sorted according to color and is ready for weaving into hats. In some countries, the weaving is done on mechanical looms. But in many parts of Europe, Japan, and China, the work is done by hand. Some of the best hand-braided straw comes from Tuscany, Italy, where Leghorn straw braids are made from a special kind of straw. Panama hats are not made from a straw, but from the leaf fiber of a small palm tree.

Straw is different from hay, which is the dried grasses of other plants used as feed for domestic animals. F.T.N.

**STRAWBERRY.** The strawberry is a small plant belonging to the rose family. It is grown for its tasty fruit. The strawberry plant grows close to the ground, and has a short woody stem. The leaves grow on the stem in groups of three. The roots of the strawberry are very short. The strawberry has small white flowers which have a pleasant odor. The strawberry fruits are greenish white at first, and then turn to a rich red color when they ripen. These berries give off a pleasant fragrance and have a delicious taste. They are the earliest fruit in the garden. The berries seem to be strewn, or scat-



The Heart-shaped Juicy Strawberry has a delicious flavor and aroma. Strawberries taste as good as they look, and are often eaten as dessert. The red fruit makes tasty jams and jellies. "Strawberry" is a popular flavoring.

## The Leading Strawberry States

Louisiana



Oregon

Michigan

California

Tennessee

Washington

Arkansas

Florida

Virginia

North Carolina

Each symbol stands for  
200,000 crates of 36 pounds.  
Based on Government Statistics  
for a 4-year period

tered, among the leaves of the plant. For this reason, the plant first had the name *strawberry*, which in time was changed to *strawberry*.

The fruit of the strawberry is different from the true berry, such as the huckleberry. It is different because it does not have an outer skin around the seed. The strawberry fruit is a fleshy, swollen fruit which has its dry yellow seeds on the outside of the fruit. When the strawberry ripens, the petals of the flower fall off and all that is left is the calyx, which is the leafy substance shaped like a star. Not every strawberry flower produces fruit, however. Some flowers do not have stamens. These must be planted near plants that have stamens, so that the seeds can be fertilized by the pollen. This type of pollination is known as *cross pollination*.

The strawberry plant does not reproduce by seeds. During the season when the fruit is developing, the plant sends out slender growths called *runners*. These look like strings. They grow on the ground and send out roots in the soil. The roots produce new plants which grow and bear fruit. Sometimes these plants are taken from the soil and replanted to start a new plantation of strawberry plants.

The strawberry fruit is one of the most important small fruits grown in the Western Hemisphere. It grows both as a wild plant and as a cultivated plant. The strawberry was originally grown in Northern Europe, but wild species also are found in the Soviet Union, Chile, and the United States. The first American species of strawberry was cultivated about 1835. Today, every state in the United States and every province in Canada grows the strawberry plant.

Strawberry plants can be planted in any garden soil. But the richer the soil, the larger the crop. The plant grows best in a cool, moist climate and does not do well in warm temperatures. The strawberry is planted in rows. Young plants are used for setting the rows. The rows are usually three feet apart and the plants are set eighteen inches apart in the rows. The plants may be planted in the spring or fall, but if the temperature is too cold, fall planting requires a great deal of care. Some strawberries, called *everbearing*, produce berries throughout the summer and fall.

The strawberry fruit has a delicious taste and can be prepared in many tasty dishes. The fruit is a good source of vitamin C. Strawberries are exceptionally well adapted to quick freezing. The frozen berries, like the fresh ones, are used in ice cream, pastries, and jellies.

See also PLANT (color plate, Some Members of the Rose Family).

**Classification.** The strawberry belongs to the family *Rosaceae*. Two common American species are the *Fragaria virginiana* and the *Fragaria chiloensis*.

**STRAWBERRY BASS.** See BASS.

**STRAWBERRY GUAVA.** See GUAVA.

**STRAWBERRY SHRUB.** See CALYCANTHUS.

**STRAWFLOWER** is a tall annual herb with yellow, orange, red, or white flowers. These are dried and used as winter bouquets. The strawflower grows in many parts of the Eastern Hemisphere, and is now raised in gardens in Europe and America. The plant grows to a height of three feet, with flowers about one and a half inches wide. It is grown by seeds which may be planted outdoors or in greenhouses.

**Classification.** The strawflower is in the *Compositae* family. Its botanical name is *Helichrysum bracteatum*.

**STREAMLINING** means shaping an object, such as an airplane, so that it will offer very little resistance to the wind as it moves. A streamlined body is shaped somewhat like a raindrop. The body is round and blunt in front. It swells up smoothly for a short distance, and then gradually tapers down to a point. This shape is often used in the design of airplanes, boats, automobiles, and trains.

Streamlining works on a simple principle that can be seen in nature. Fish are streamlined so that they can



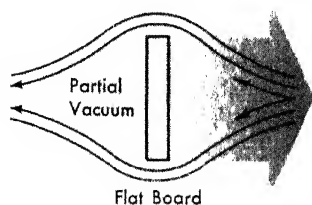
J. Horace McFarland

The Tall, Colorful Strawflower brightens gardens in summer and makes quaint bouquets after it has been dried.

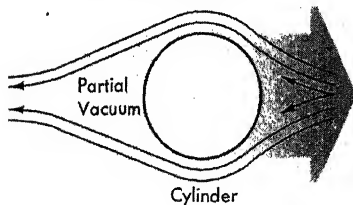
glide easily through the water. A fish that swims rapidly, such as the trout, is slimmer and more streamlined than the catfish, which swims slowly. The resistance of an object to the air or other fluid through which it moves is known as *drag*. The less drag there is, the greater will be the speed of the moving object, or the less effort will be required to move it at the desired speed.

The shape of an object can largely determine the amount of drag that will be present. If a flat plate is placed at right angles with a wind, the wind will blow against the front surface of the plate and curve around the ends of the plate to the other side. The air against the back surface of the plate will be disturbed and there will be a partial vacuum. This space will offer great resistance to the wind. If a cylinder is placed in the wind, the resistance will be less than that of the flat plate. But there will still be a partial vacuum on the

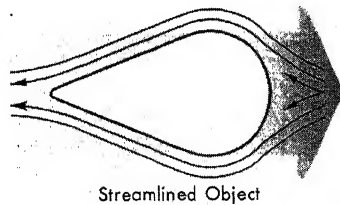
## STREAMLINING



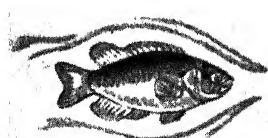
Flat Board



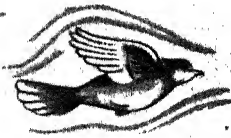
Cylinder



Streamlined Object



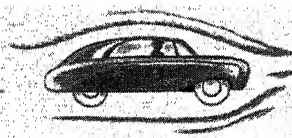
Fish



Bird



Airplane



Automobile



back surface of the cylinder. This partial vacuum will add greatly to the resistance. If a streamlined object is placed in the wind, the air will move around the curved front and taper off along the sides of the body. This type of object offers the least resistance to the wind and will therefore allow the greatest speed.

Streamlining is particularly important for objects that are to move at a very high speed. The greater the speed the greater the resistance that will be offered to the wind. The amount of resistance to the wind depends upon the area of the body in square feet, the velocity of the body in miles per hour, and a factor that is always the same for the same shape of the body, known as the *coefficient*. The formula for this can be stated as,  $R = CAV^2$ , where R equals resistance, C equals the coefficient which is different for different shaped bodies, A equals the area, and V equals the velocity.

E.A.PE.

See also AERODYNAMICS.

**STREETCAR.** The first streetcars were pulled by horses. They were called *horsecars*. Later a *cablecar* was invented. It was pulled by a cable, which was drawn by steam power. The cable ran through a small trench in the surface of the ground. The streetcar attached itself to the cable by means of a gripping device. Therefore it also was called a "grip" car.

In the early 1800's, inventors began trying to use electric power. But for many years the cost of generating electricity was too great to be practical. The invention of the dynamo solved this problem, and by the 1880's a number of electric cars were exhibited. The first electric railway was operated in Sichterfelde, Germany, in 1881. In the United States, in 1888, Frank J. Sprague opened the first successful electric "street railway," as it was then called, in Richmond, Va. Electric cars immediately began to replace cable cars and horsecars throughout the country.

The modern streetcar gets its power from an overhead line by means of a long trolley pole. The current is generated in a central powerhouse and passes along heavy copper wires which make up the overhead line. The usual type of car has a small trolley wheel, or "shoe," which rides along the line, conducting the current to the trolley pole, down which it passes to the motors under the car. The current leaves the motors by means of the tracks, and passes back to the central generator to complete the circuit.

The electric motors are attached to the driving axles

of the car by gears. The motorman controls the speed by regulating the current with a control lever.

Each car has seats for fifty or more people. Straps hang from the ceiling in the front and rear aisle for people who are unable to find a seat.

Today every large city is veined with a great network of streetcar lines. They have helped make the growth of cities possible by providing transportation in an area such as Chicago, for example, which covers well over a hundred square miles. Only San Francisco, where there are many steep hills, still uses cable cars.

Some cities use a variant of the streetcar called the *trolley bus*. This is a bus body not using a track, but getting its power from an overhead trolley. Trolley buses were introduced in 1913 and are still in limited use.

Streetcars are growing less important as a means of transportation. Large cities are turning more to subways and buses for transportation. But several cities have put in operation streetcars of new and improved design. These are much faster, quieter, and larger than the old models.

F.M.R.

See also ELECTRIC RAILROAD.

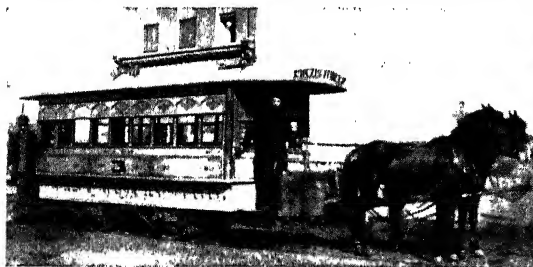
**STREET, ELECTRIC RAILWAY AND MOTOR COACH EMPLOYEES OF AMERICA, AMALGAMATED ASSOCIATION OF.** This is a labor union affiliated with the American Federation of Labor. It has about 200,000 members organized into 561 locals in the United States and Canada. Anyone who works within the union's jurisdiction and is in good health may become a member.

The Association's jurisdiction extends to cover the operation of streetcars, electric railways, and motor coaches. Gatemen, watchmen, and most of the men who maintain these vehicles also are eligible for membership.

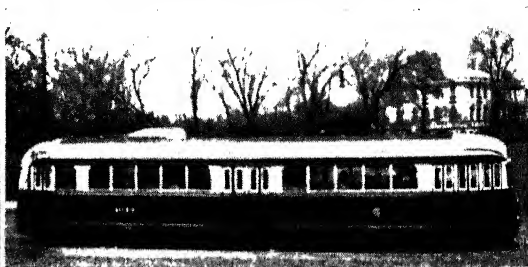
The union was founded in Indianapolis, Ind., in 1892. It has headquarters in Detroit, Mich. The union publishes a monthly magazine called the *Motorman, Conductor and Motor Coach Operator*.

C.J.M.

**STREETER, RUTH CHENEY** (1895- ), became the first director of the United States Marine Corps Women's Reserve in 1943. During World War II she rose to the rank of full colonel. Ruth Streeter was born in Brookline, Mass., and attended Bryn Mawr College for two years. Later she became active in health and welfare work. She served on numerous New Jersey social service boards, including the State Relief Council, the



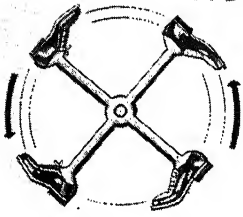
**The Horsecar Was a Forerunner of the Modern Streetcar.** The horsecar of 1878 was a swaying, noisy car which ran on two rails and was pulled by horses. A small stove, and straw scattered on the floor, kept the passengers warm in cold weather.



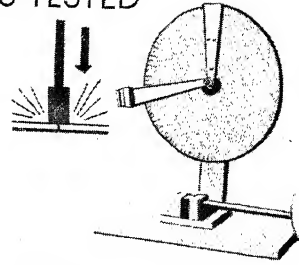
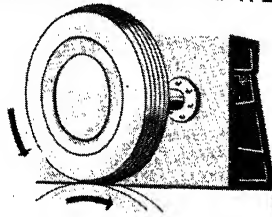
infare Lines

icy or muddy weather means little to the silent, fast-moving modern streetcar. Electric power is picked up by the overhead trolley and turns the wheels. Electric heating, defrosters, and air brakes insure comfort and safety.

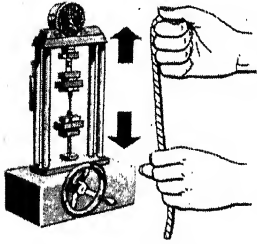
## HOW STRENGTH OF MATERIALS IS TESTED



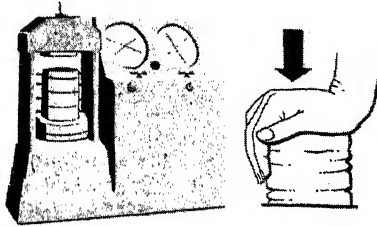
Both strength and wearing qualities of such items as shoes and tires are tested on machines. Such machines duplicate within the laboratory the actual conditions of ordinary use.



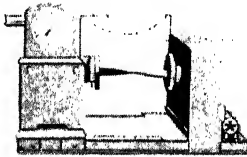
Resistance of plastic materials to crushing is determined by the heavy blows of this machine.



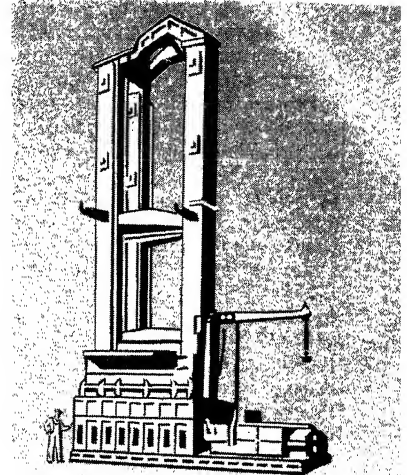
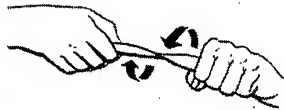
Tensile strength of thin metal strips is tested much as one tests the strength of cord.



Compression resistance is tested by machines that crush materials under tremendous pressures.



The ability of materials to resist twisting, or torsion, is recorded in machines that measure the force necessary to twist apart anything from fine wires to great bars of steel.



Some testing machines can exert a pull of more than 2,000,000 pounds.

Commission of Inter-State Co-operation, and the Board of Children's Guardians. See also MARINE CORPS WOMEN'S RESERVE.

**STREET RAILWAY.** See STREETCAR.

**STREETS.** See ROADS AND STREETS.

**STRENGTH OF MATERIALS** is the term engineers use in determining how much force a material will take without breaking, and how much it will change in shape and size when an outside force is applied to it. When a force is applied to a material, as when a weight is put at the end of a rope, certain forces are set up inside the rope which cause the rope to stretch. The heavier the weight, the more the rope will stretch. In mechanics, the weight that is applied is called the *load*. The force within the rope that causes it to stretch is called the *stress*. The actual change, in this case the stretching, is called the *strain*. There are three changes that can take place in a material due to stress. A material can stretch, it can get shorter, or it may divide up in layers. The stress that causes a material to stretch is called *tensile stress*. The stress that causes a material to get shorter is called *compressive stress*, while a stress which causes a material to divide into layers is called *shearing stress*. *Flexural* or bending loads, and *torsional* or twisting loads, produce

combinations of the other types of stress which can effect various materials.

Every material offers a certain amount of resistance, or opposition, to changing its size and shape. How much resistance a material offers depends upon its strength, hardness, stiffness, elasticity, and flexibility. These *mechanical properties* are different for each material. For example, steel, wood, concrete, and cast iron are four materials which differ greatly in their mechanical properties. The strength of a material will also depend on the kind of stress and type of load that is put on it.

The strength of materials can be tested in the laboratory by special machines that test the resistance of a material to strain. For example, ropes, wires, belts, and cables are tested for their tensile strength. In this test, the material is tested to see how much it can be stretched before breaking. The point beyond which a wire, for example, can not be stretched without producing a permanent effect is known as the *elastic limit*. The compression strength of such bodies as pillars, posts, and foundations are tested to see whether or not they can hold up the load they will be required to hold up in actual operation. Propeller shafts on steamships are tested to see that they do not twist as they revolve. All

these tests help in the selection of the proper material for a certain structure.

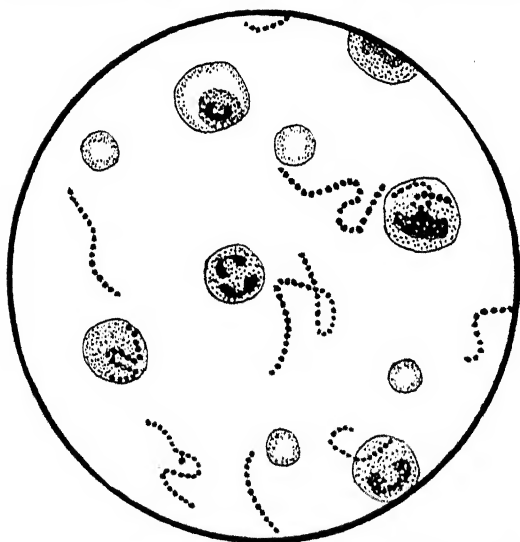
In constructing a structure or a machine, the engineer must first compute the amount of stress that is applied by the load. He then selects the material that will best withstand the conditions that will have to be met. It is often desired that a material have a great deal of tensile or compression strength and yet be light in weight. This may be accomplished by casting a metal in a hollow form. It must be remembered that the engineer always uses a material that will be strong enough to carry several times the load that it is expected to carry.

The measurements that are obtained from the testing machines are not exact. The values may change under different conditions. For example, small pieces of dry wood have a tensile strength of 3,000 to 10,000 pounds per square inch. But when there is moisture in the wood, the strength of the wood is lessened. Portland cement concrete has a compressive strength of 2,000 to 5,000 pounds per square inch. This strength increases with age and varies according to the amount of water and cement used in the concrete. R.F.P.

See also TENACITY.

**STREPSIPTERA**, *strep SIP ter ah*. See INSECT (Classifying the Insects).

**STREPTOCOCCUS**, *STREP toh KAHK us* (plural, streptococci, *STREP toh KAHK sil*), is a type of bacteria which is the cause of several serious diseases. Bacteria are sometimes considered the lowest form of plants. The streptococci are shaped like spheres and live together, forming chains. They infect the body by growing in it and producing poisons, called *toxins*. Sometimes a colony grows



American Medical Association

The Black Beadlike Chains are Streptococcus Germs

in one place, but some types of streptococci may spread through the body. The type *Streptococcus pyogenes* include the bacteria of septicemia (blood poisoning) impetigo, puerperal fever, septic sore throat, and scarlet fever. *Streptococcus pneumoniae*, called *pneumococcus*, is the cause of one kind of pneumonia. G.J.B.

See also BACTERIA; TOXIN.

**STREPTOMYCIN**, *STREP toh MI sin*, is a drug that fights the bacteria which cause many diseases. It also is said to be successful sometimes against infections which resist the sulfa drugs and penicillin. See PENICILLIN; SULFA DRUGS.

Streptomycin is an extract of a bacterium, or tiny plant, that grows in the soil. The name of this bacterium is *Streptomyces griseus*. In 1939, scientists at Rutgers University began to test microscopic growths to find a substance that could be used against disease germs. The best substance they found was formed by *Streptomyces*, and was therefore named streptomycin.

Streptomycin is given off into a broth in which the bacteria are grown. The impure drug can be separated from the broth as a yellow, brown, or red solution, or as a solid. Further methods purify the drug to small crystals of its salts, which form a white powder.

Chemically, streptomycin is an organic base, and forms several salts. The solid drug can be stored in a refrigerator six months without losing its power, and solutions keep their power for many days, even when heated.

Streptomycin can be injected into the veins, into the muscles, or under the skin. It has been taken by mouth for diseases of the intestines. Streptomycin also has been sprayed into the lungs. It has been reported that the drug has checked types of streptococcus and staphylococcus that resist penicillin, sulfa drugs, and serums. These include bacteria of the Gram-negative type, and mycobacteria. Streptomycin also acts against certain Gram-positive bacteria.

Streptomycin acts by interfering with the growth of the microbes. This effect is *bacteriostatic*. Sometimes it also kills bacteria, a *bactericidal* action. Streptomycin has been used for infections of the urinary passages, typhoid fever, pneumonia, dysentery, undulant fever, and such wound infections as gas gangrene. It seems very effective in many cases, but it will never replace penicillin or the sulfa drugs. Each drug has its own usefulness and frequently may supplement the action of another. A.E.S.

**STRESEMANN**, *STRAY zeh mahn*, **GUSTAV** (1878-1929), was a German statesman. He was one of the authors of the Locarno Pact and secured the admission of Germany into the League of Nations. Stresemann was born in Berlin and was educated at the universities of Berlin and Leipzig. He became one of the leading businessmen of Saxony and in 1906 was elected to the Reichstag, or German parliament. By 1917 he was the leader of the National Liberal party. Later he headed the German People's party. In 1923 he became Chancellor and Foreign Minister. He was awarded the Nobel peace prize in 1926 because of his efforts for peace. See also LOCARNO CONFERENCE; NOBEL PRIZES. F.S.M.

**STRIA**, *STRI ah*. See GLACIER (Erosion).

**STRIBLING, THOMAS SIGISMUND** (1881- ). See TENNESSEE (Arts and Crafts).

**STRICKLAND, WILLIAM** (1787?-1854). See TENNESSEE (Arts and Crafts).

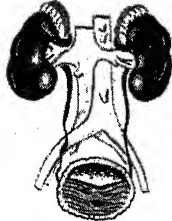
**STRIKE**. See GEOLOGY (Terms [Dip]).

**STRIKE**. The use of the strike as a means of forcing employers to grant certain demands of their workers developed along with the factory system during the early 1800's. The stopping of work by all or part of a group of

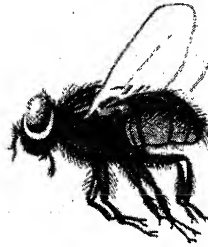
## DISEASES TREATED WITH STREPTOMYCIN



Bubonic Plague



Urinary Infection



Typhoid Fever



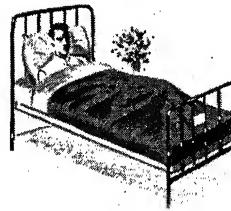
Cholera



Undulant Fever



Tularemia



Tuberculosis



Whooping Cough

workers was rare during the earlier period of hand labor under the guild system. Most employers had only a few workers, and these could easily reach the employer with their complaints. Under the factory system, however, there were often too many workers for the employer to deal with individually. When the workers felt they needed more money or better working conditions, they found they could better draw attention to their demands by stopping work.

Strikes began to increase during the late 1800's and early 1900's, along with the rise of labor unions. The unions used the strike not only as a means of forcing the employers to grant the demands of the union workers, but also as a way of enlisting unorganized workers into the union.

Strikes are usually called because the employer has refused to meet the demands of his workers for higher wages. But strikes are called for other reasons, such as an employer's refusal to recognize a union as the bargaining agent for his employees, refusal to grant changes in working conditions and rules, or refusal to transfer or dismiss superiors who are unpopular with the workers. Strikes also have been called against others than the employer himself, such as strikes protesting the wage decision of an industrial arbitrator or a government labor agency.

Strikes are most numerous during periods of good business. In the United States, the number of strikes increased sharply during the prosperous periods before and after World Wars I and II. Strikes conducted during periods of slack business are generally aimed at preventing wage cutting.

The right of workers to strike, so long as they do not violate any laws in connection with their striking, has been upheld by the courts. Abraham Lincoln was one

of the first American statesmen to uphold labor's right to strike.

**Kinds of Strikes.** Most strikes are conducted by labor unions. Some unions provide that the president or other high-ranking officers may order a *called strike* if employers violate a union contract or cannot agree on a new contract sought by the union. Other unions provide that a called strike must first be approved by a majority vote of the union members. When local unions or smaller groups of union members strike without authorization by the union officials or a vote of the members, the strike is called a *wildcat strike*. Union leaders usually try to get these workers back on the job. A strike in which workers stop their labor, but do not leave their place of employment, is called a *sitdown strike*. A *sympathetic strike* is one in which a group of workers strike against their employer because they sympathize with the demands of another group of workers striking against another employer. The purpose of the sympathetic strike is to bring pressure from one employer on another to end the work stoppage. A *jurisdictional strike* is called when a union believes the employer has given work to another union which properly belongs to the striking union. A *general strike* is one which involves all the workers within a particular industry or community.

**Strike Strategy.** A strike is a declaration of economic war against an employer, and union leaders take every step possible to make sure that the war will be won. Money is an important consideration to the striking union, since most workers do not have enough savings to provide for themselves and their families through a long strike. Many unions have special strike funds which are used to help feed and house the strikers. Donations of money are often asked for from other unions and from the general public. Frequent meetings are held to keep

strikers informed of progress, and social gatherings are planned to keep up their spirits.

Lines of marching workers, called *picket lines*, are usually established around the employer's place of business. The pickets carry signs or banners declaring that the employer is unfair to his workers. The purpose of the picket line is to discourage strikers or other workers from seeking jobs, and to discourage customers from patronizing the place while the strike is going on. The right of strikers to maintain peaceful picket lines has been upheld by the courts. Violence often occurs in picket lines, however, because of clashes between strikers and non-strikers, company police, municipal or state police, or National Guard troops. Gangs of sluggers and gunmen, called *goons*, sometimes have been hired by one side or the other in labor disputes. But this practice has declined.

**Strike Settlements.** A strike ends in one of several ways. The strike may be broken, that is, the employer may succeed in hiring other workers, called strike-breakers or *scabs*, to carry on his business, or the strikers may become unable to carry on any longer without regular income. In such an instance, the strikers may lose their jobs altogether, or be forced to go back to work at their old rate of pay. The strike may end in a compromise, with the employer granting part of the workers' demands. Often the strike ends in complete victory for the strikers, with all their demands granted.

The methods of reaching a settlement include negotiation, conciliation or mediation, and arbitration. In *negotiation*, the employer and representatives of the strikers meet and discuss the demands of the workers until an agreement is reached. In *conciliation* or *mediation*, a third party meets with the employer and the workers and helps them reach a settlement. The United States Department of Labor maintains a Bureau of Conciliation for this purpose.

*Arbitration* is the settling of the strike dispute by leaving it to the judgment of a third party. The arbitration may be voluntary,

that is, agreed upon by employer and workers in negotiation of contract, or compulsory, in that it is ordered by a government agency. R.D.P.

See also ARBITRATION; BOYCOTT; COLLECTIVE BARGAINING; LOCKOUT.

### STRINDBERG, AUGUST

(1849-1912), was one of the greatest Swedish writers of modern times. He was widely known as a novelist and a playwright. Strindberg's plays were partly responsible for the Expressionistic dramas that were popular in Europe and the United States after his death. He was noted as a

woman hater, and many of his works reveal his bitterness toward women. Strindberg was born in Stockholm, and was educated at Upsala University. His first important play, *Master Olaf*, was produced in 1878. B.H.C.



P&amp;A

August Strindberg, modern Swedish playwright

**His Works** include *The Father*, *Miss Julia*, *A Fool's Confession*, *The Natives of Hemsö*, and *Utopias Realized*.

**STRING.** See TWINE.

**STRING BEAN.** See BEAN (Kinds of Beans; How Beans Are Grown).

**STRINGED INSTRUMENT.** See MUSICAL INSTRUMENT; ORCHESTRA; SOUND (Production of Musical Sound).

**STRINGER, ARTHUR JOHN ARBUTHNOTT** (1874- ), is a Canadian writer. His own broad experiences furnished the background for many of his stories. His unsuccessful ventures in wheat and tobacco growing in the Alberta foothills served as the basis for three of his novels. They were *The Prairie Wife*, *The Prairie Mother*, and *The Prairie Child*.

*The Loom of Destiny*, his first volume of short stories, resulted from his newspaper reporting experiences in New York City. For a time he was an editorial writer for the American Press Association, and then he became literary editor of the magazine *Success* for a year.

Stringer was born in London, Ontario, and was educated at the universities of Toronto and Oxford. W.S.W.

**His Works** include *A Study in King Lear*, *Pauline* and *Other Poems*, *The Mud Lark*, and many mystery stories.

**STRING QUARTET.** See CHAMBER MUSIC.

**STRINGY-BARK EUCALYPTUS.** See EUCALYPTUS.

**STRIPED BASS.** See FISH (color plate, Salt-Water Fish).

**STRIPED GOPHER.** See GOPHER (illustration).

**STRITCH, SAMUEL CARDINAL** (1887- ), was named a Cardinal of the Roman Catholic Church by Pope Pius XII in February, 1946.

Cardinal Stritch was born in Nashville, Tenn. He was an excellent student, and was graduated from high school when he was fourteen. At seventeen, he received his B.A. degree, and after two years of study at the North American College in Rome, received his Ph.D. degree. A special dispensation had to be secured to permit him to be ordained a priest when he was twenty-three.

The future cardinal first served in Tennessee. He became Bishop of Toledo, Ohio, in 1921, the youngest American ever to become a bishop. In 1930, he was named Archbishop of Milwaukee, and in 1939 succeeded George Cardinal Mundelein as Archbishop of Chicago. F.J.S.

See also CARDINAL.

**STROBOSCOPE, STRAHIB oh slohp.** The stroboscope is an optical device for making swiftly rotating machinery seem to stand still. It depends on the principle that the eye must take an appreciable fraction of a second to see an object.

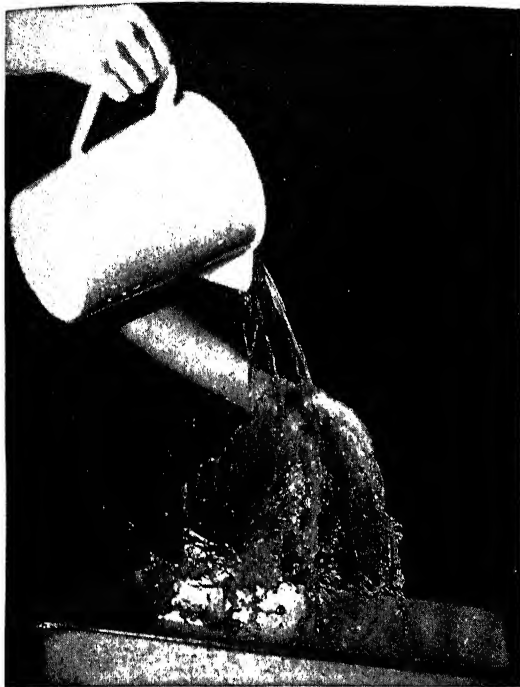
If a machine in rapid motion is viewed by ordinary light, the moving parts are seen only as blurred masses. No details of their shapes can be seen. The eye can see



Acme

Samuel Cardinal Stritch was the youngest American to become a Bishop of the Roman Catholic Church.





Conn, Black Star

The Lightninglike Flashes of Light from the stroboscope make it possible for the photographer to "freeze" the motion of this pouring water in a split second.

only about sixteen impulses per second. Faster than this it does not behold anything clearly. But now, instead of using ordinary light, let us illuminate the moving machine with a single flash of lightning. The flash is very bright and comes very fast, and as it shines on the moving machinery, everything seems to stand still.

Illumination by lightning is not practical, but artificial lightning can be made that will give bright flashes as often as we need. If the flashes are timed to synchronize with the rotation of the machine, the eye sees the machine as standing still, even though the wheels are in rapid motion. If the flashes are timed a little slower than the rotation of the machine the wheels appear to be running slowly in one direction, while if we time the flashes a little faster than the rotation, the machine appears to be running in the opposite direction. If there is any unwanted vibration in the moving machinery, a stroboscope will quickly discern it. The stroboscope also is used to provide the light for high speed photography.

P.H.C.

**STROHMMEYER**, *SHTRO my er*, **FRIEDRICH** (1776-1835). See CADMIUM.

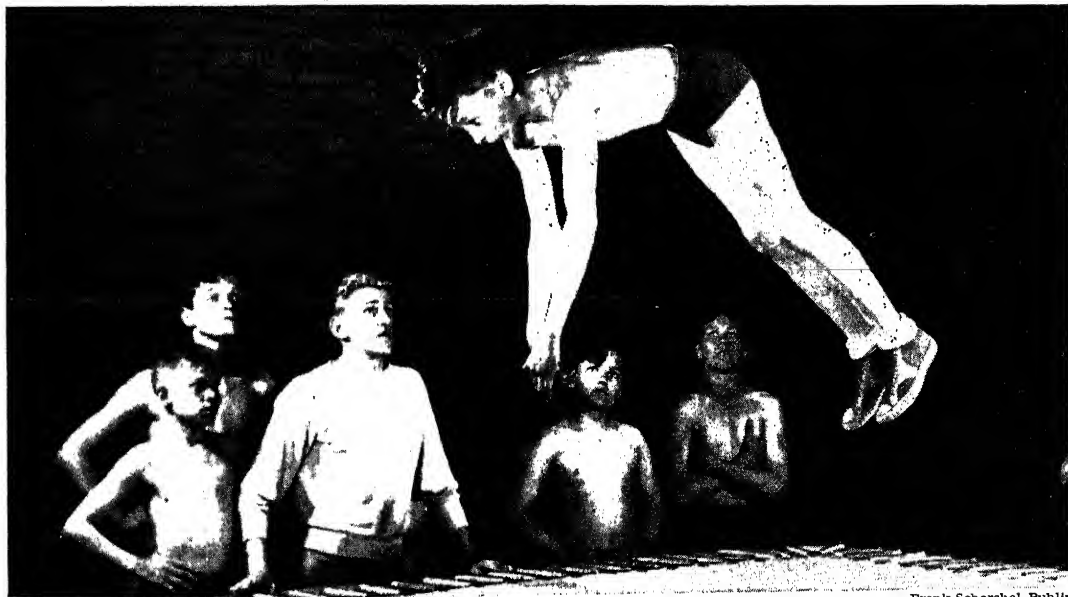
**STROKE**. See APOPLEXY.

**STRONTIUM**, *STRAHN shih um* (chemical symbol, Sr). This pale yellow metallic element is found in compounds in rocks, soil, and mineral waters. Strontium is harder than lead. It is ductile (capable of being drawn into a wire) and malleable (capable of being hammered into a sheet). Strontium hydroxide is used in extracting sugar from molasses. Strontium nitrate often is used in fireworks because it colors a flame crimson. Strontium peroxide is used for tracer bullets, which mark their path toward the target with a white light. The "red fire" used for railroad signal flares and distress rockets is a mixture of potassium chlorate, shellac, and strontium nitrate. Other compounds of strontium are used in certain medicines. The element was first found in the lead mines of Scotland.

H.A.Sc.

**STRUCTURAL ENGINEER**. See **ENGINEERING** (Kinds of Engineering).

**STRUCTURAL IRON WORKERS, INTERNATIONAL ASSOCIATION OF**. See **INTERNATIONAL ASSOCIATION OF BRIDGE AND STRUCTURAL IRON WORKERS**.



Frank Schershel, Publix

Motion Is "Frozen" by the Light of a Stroboscope and the camera catches a member of a boy's tumbling team in mid-

air as he starts a forward flip. The brilliant stroboscopic flashes of light simplify high-speed photography.

**STRUGGLE FOR EXISTENCE.** See EVOLUTION (Darwin's Theory); NATURAL SELECTION.

**STRUTHER, JAN** (1901- ), is the pen name of Joyce Anstruther Maxtone Graham, an English writer. Her works include poetry, essays, and sketches. Her book *Mrs. Miniver* is a collection of sketches of family life in England in the first months of World War II. It was a best seller, and was made into a popular motion picture. Jan Struther was brought up in London and was educated in private schools. She began her writing career with humorous sketches and verse for magazines.

L.G.Wt.

**Her Works** include the books of poems *The Modern Struwwelpeter* and *When Grandmother Was Small*; and *The Glass Blower*.

**STRUTT, JEDEDIAH** (1726-1797). See KNITTING MACHINE.

**STRYCHNINE** (chemical formula,  $C_{21}H_{22}N_2O_2$ ), is a very bitter and poisonous drug that is obtained from the seeds of plants such as *nux vomica*, which is found in the West Indies. Strychnine comes in white crystals. It has been used in small doses as a tonic, but its value for this purpose is now in doubt. A larger dose of strychnine causes a serious case of poisoning in the body which results in convulsions. The usual symptoms of poisoning from strychnine are violent twitching, difficulty in swallowing, and a sudden bending backward of the body. The victim of such poisoning often suffocates.

The most important thing to remember is that strychnine should never be taken except under the prescription of a physician. In case of poisoning, the patient must immediately be given sedatives, and be kept absolutely quiet.

A.E.S.

See also ALKALOID; ANTIDOTE; NUX VOMICA.

**STUART, or ALICE SPRINGS,** Australia. See AUSTRALIA (Cities).

**STUART, CHARLES EDWARD LOUIS** (1720-1788), was a pretender to the English throne. He also was known as "Bonnie Prince Charlie," "The Young Pretender," and "The Young Chevalier." Stuart was born in Rome, the eldest son of James Edward Stuart and the grandson of the deposed James II of England. In 1745 he tried to win back the English throne with the aid of the Highland clans of Scotland, but his army was decisively defeated on Culloden Moor. Stuart escaped to France and lived on the continent of Europe the rest of his life. See also STUART.

P.Kn.

**STUART, GILBERT CHARLES** (1755-1828), was an early American portrait painter. He is probably best known for his portraits of George Washington. Stuart made at least forty paintings of Washington. The most famous is the "Athenaeum" head, showing the left side of Washington's face. This portrait, like many of Stuart's other pictures, is unfinished. He spent all his time in drawing the head exactly right and then lost interest when he came to painting the clothes.

Stuart was born near Newport, R.I. He began to paint when he was thirteen years old and before he was twenty he had begun to accept commissions. During this time he received only the most elementary training, but in 1775 he went to London to study. Between 1778 and 1782 he lived and worked with Benjamin West.



Brown Bros.

**Gilbert Stuart's Portrait of Himself** shows his usual habit of leaving the background only partly finished. He was interested only in the subject of his pictures, and did not have the patience to fill in background details.

(See WEST, BENJAMIN.) Stuart became a fashionable portrait painter in London and then moved to Dublin where he also built up a large practice. About 1793 he returned to America with the idea of painting a great number of portraits and prints of Washington. Stuart believed there would be a wide market in the United States for portraits of the first President.

In 1795 Stuart painted his first Washington head in Philadelphia. Later he lived in Washington, D.C., and painted many of the statesmen of the time. After 1805 he lived in Boston.

M.Br.

See also PAINTING (Great American Paintings, color plate, George Washington).

**His Works** include "Washington at Dorchester Heights," and portraits of George III, George IV, Louis XVI of France, Benjamin West, and Sarah Kemble Siddons.

**STUART, HOUSE OF.** The House of Stuart is the name given to a powerful royal family of England and Scotland. The Stuarts ruled the two countries during most of the 1600's and during the first fourteen years of the 1700's. The Stuarts were harsh, undemocratic rulers. They believed firmly that "the king can do no wrong."

The first Stuart to rule over England was James VI of Scotland. He was the son of Mary, Queen of Scots. He came to the English throne in 1603, after the death of Queen Elizabeth, who was the last ruler of the House of Tudor. He thus brought both England and Scotland under his rule. The new king took the title of James I.

After the death of James in 1625, Charles I ascended the throne. His reign was a cruel dictatorship. In 1649 the English Parliament finally had him beheaded, and

a British Commonwealth was set up. In 1660 the Stuart family again came to the throne. The ruler was Charles II, a son of Charles I. When Charles II died in 1685, his brother, James II, became king. James was doubly disqualified for the English throne: he was both a despot and a Catholic. At that time, England was definitely Protestant and committed to parliamentary government. James II was forced to leave the throne after the bloodless Revolution of 1688. His crown passed to his daughter Mary and her husband, William of Orange. Mary and William became joint rulers of the kingdom. In 1702 Anne Stuart, a sister of Mary, came to the throne. She was the last Stuart ruler. During her reign, England and Scotland were united as a single nation known as Great Britain. J.S.S.

See also ANNE; CHARLES (I and II, England); JAMES (I and II, England); MARY (II, England); MARY (Queen of Scots); STUART, CHARLES EDWARD.

**STUART, JAMES EWELL BROWN** (1833-1864), was a Confederate general of cavalry during the War between the States. He distinguished himself in the first Battle of Bull Run and was made major general after the Seven Days' Battles. He served with "Stonewall" Jackson at Chancellorsville and commanded Jackson's corps for a short time after Jackson was wounded. "Jeb" Stuart, as he was called, fought several successful actions in the Wilderness campaign. He was killed at Yellow Tavern in 1864 while trying to stop the advance of General Sheridan against Richmond.



Brown Bros.  
"Jeb" Stuart, famous Confederate cavalry leader

Stuart was born in Patrick County, Virginia, and was graduated from the United States Military Academy. Later, he was sent to enforce order in Kansas in 1856. He served against the Cheyenne Indians in 1857. He resigned from the United States Army in 1861 to join the Southern forces. H.J.E.

**STUART, JESSE HILTON** (1907- ). See KENTUCKY (Arts and Crafts).

**STUART, JOHN McDOUALL** (1815-1866). See EXPLORATION AND DISCOVERY (Table of Famous Explorers [Inland Explorers]).

**STUART, MARY.** See MARY (Queen of Scots).

**STUBTOE STATE.** See MONTANA.

**STUCCO, STU'K o.** This plastic material can be applied with a trowel to form a hard covering for outside wall surfaces of a building or other structure. Stucco is made of sand and a cementing material, such as Portland cement or lime, and water. White Portland cement is used in making light-colored stucco. Gypsum cements are not suitable for stucco because they dissolve slowly in water and thus are not durable when exposed to rain. Various coloring materials may be added to stucco, and a variety of surface finishes may be used. When stucco is properly prepared and applied, it forms a durable and attractive outside wall surface. But the structure underneath must be rigid in order to avoid cracking, and also

to keep rain from getting behind the stucco, which would cause it to fall off. The tools used in applying stucco are the same as those described under PLASTERING.

W.C.H.

**STUCK, shtook, FRANZ VON** (1863-1928), was a German artist. He was known for his humorous drawings, his religious paintings, and his sculpture.

**STUCK, HUDSON** (1863-1920). See McKINLEY, MOUNT.

**STUD.** See CARPENTRY (Studs); CHAIN.

**STUDEBAKER, CLEMENT.** See INDIANA (Famous Hoosiers).

**STUDEBAKER, STOO deh BAY ker, JOHN WARD** (1887- ), is an American educator. During World War II, as United States Commissioner of Education, he organized the educational facilities of the nation behind the war effort. Under his direction, the government provided for the vocational training of millions of workers seeking jobs in defense plants. Studebaker was born in McGregor, Iowa, and was educated at Leander Clark College. In 1910 he was appointed principal of the Guthrie Center (Iowa) high school, and later became assistant superintendent of schools in Des Moines, Iowa. He was superintendent of schools in Des Moines from 1920 until 1934, when he became Commissioner of Education. He resigned as Commissioner in 1948. E.W.KN.

**STUDENT GOVERNMENT.** Many school affairs and student activities are directed by the students themselves. The entire student body usually elects a student council which governs according to a constitution. A student government that operates under a council and a constitution is called *formal*. *Informal* student government takes place only irregularly and under no definite set of rules and regulations.

**Student Government Constitutions** usually give a name to the council or governing body, provide for the election of officers, and determine the qualifications of the student voters. The constitutions also define the duties and powers of the council members and fix their terms of office. Other regulations describe the function of the faculty sponsor and the method of selecting him, and tell how, how often, and when meetings shall be called. Less important rules may be included in a set of bylaws.

The constitution may be written by the students, either alone or with the help of one or more teachers. Modern authorities say that students should take as large a share as possible in setting up the plan of government. Teachers may have to make the first suggestions, but most planning should be done by the students themselves. Student government should begin with simple, easy tasks. It should move slowly until it is firmly established and the members have gained confidence and experience.

**The Council** is responsible to the student body and should report its actions to those who elect it. There also should be opportunity for the students to discuss the council's work. In small schools, each home room may elect a member and his report will be given to that group. In larger schools, the members may be elected by classes or some other divisions of the student body. But the actions of the council must be made known to all the students if the government is to function properly.

**Promoting Student Interest** in self-government may be done in several other ways. One is to conduct the nominations and elections of officers with dignity. Another is to follow the forms of adult civic elections and of parliamentary law. A third method is to install the officers before the entire student body to impress the importance of the government upon everyone. A fourth method is to give the council the opportunity to make decisions on questions that are important to the whole school and especially to the students.

The board of education, the superintendent, the principal, and the teachers have the responsibility of governing the school. But they may delegate some of their duties to the student council which acts for the student body. Some of the functions that may be handled by the student council are safety measures, the lost and found departments, the protection of school and student property, social activities, the improvement of attendance and scholarship, the financing of clubs and activities, school campaigns, and many other matters.

**Discipline.** One of the most debated functions of the council is the matter of discipline. A few student government systems include a student court. Some of the early private schools gave the student court wide powers over all disciplinary cases. Even then the principal usually retained the veto power of court rulings. In American public schools the tendency is to limit the disciplinary power of the student council to minor offenses.

**The Purpose** of the student government is not merely to get things done, such as to prevent running in the corridors, to keep the shrubbery from being trampled, or to restore lost notebooks. The purpose also is to teach students self-control, self-government, and democratic ways of living. Students form their character through the choices they make, the actions that they take, and the responsibilities that they accept. Self-government gives students practice in making carefully considered choices and then carrying out their decisions. It accustoms them

to accepting responsibility, and gives them practice in making and carrying out their own laws. Experience in self-government prepares the students to take an active and intelligent part, as adults, in democratic government in the community, state, and nation. Student government also provides valuable experience in conducting meetings, and in debate and parliamentary procedure.

**History.** Student government originated in the 1700's as a result of the rise of political democracy in many countries. Student government was introduced into schools in Switzerland, Germany, Great Britain, the United States, and elsewhere. Thomas Jefferson set up such a plan in the University of Virginia. About 1816, the Hazelwood School of England had a student court that had the power to try offenders in all cases. The officials of the school believed that education has two great purposes — government and instruction. They held that school government was a means of political education, and gave the students all possible power in governing themselves.

A study of the Hazelwood School methods indicates that student government was fairly successful there. Many modern authorities believe that the Hazelwood plan is the most successful. Others say that students should have only limited powers and very little disciplinary authority. Further experiment will be needed to settle this important question.

The National Self-Government Committee, 80 Broadway, New York City, is the pioneer association in the promotion of student government in American schools. It publishes some student government material for free distribution. A similar organization is the National Association of Student Councils, which has its headquarters at Fall River, Mass. The *Student Council Handbook*, prepared by the National Association of Secondary School Principals, Washington, D.C., shows tried methods of founding and organizing student government in high schools.

H.G.G.



Activities and Problems of Student Government Are Discussed by This High-School Student Council

## STUDY



Harold M. Lambert

**STUDY** means to apply the mind to any subject in order to learn about it. Study is accomplished mostly by means of reading, observation, questioning, and reflection. It is a part of the process of learning. The purpose of study is the discovery of information. The student obtains facts and skills by which he can organize and express his thoughts and talents.

For many years, study on the part of school children was done mostly for the purpose of being able to recite well in school or to get a high mark. Such study was largely a matter of memory work. Its aim was often only to give the answers the teacher would require.

### Effective Study

Effective or successful study consists of much more than merely memorizing facts. It calls for knowing where and how to obtain facts, and the ability to make intelligent use of them. It means that the student must be able to organize, classify, and arrange facts in their proper relationship to the subject being studied. To study successfully, a student must decide what is important information, and then form opinions concerning it. All these things must be done to the best of his ability in the shortest possible amount of time. Because knowledge is very important to every person, it is wise to learn how to study.

### Aids to Effective Study

**Good Physical Condition.** The mind works best when

the body is in good physical condition. Good health demands that we eat properly and get enough rest, sleep, exercise, and recreation. Certain physical defects make study especially difficult. Poor eyesight, for example, can be a great hindrance to study, and should be corrected. But many physical handicaps need not prevent one from learning to study efficiently. A crippled child may learn to study as well as any one if adequate provisions are made.

**Favorable Surroundings.** Every child needs a place where he can study regularly without interruptions. He must have a desk or table to write on and a chair. Both must be of the proper height to fit his body. Both children and grownups grow tired less quickly when sitting straight in a comfortable chair. Good light, either daylight or artificial light, is necessary to prevent eyestrain. The desk or table should be located so that the light will fall over the left shoulder on the reading matter. The amount of light should be enough to read by easily, but not so much as to cause glare, which results in eye fatigue. Noise and other distractions should be eliminated. Room temperature should be neither too hot nor too cold.

**Study Materials.** Certain study materials are usually required by the student. These usually include pencils, pens, ink, erasers, paper, notebooks, and paper clips. Additional equipment will be needed for certain subjects. Geometry may call for a compass, a ruler, a protractor, and a triangle. Besides the required textbooks, a good



dictionary, a readable encyclopedia, maps, and other reference works will give valuable aid. Some provision should be made for keeping notes and work papers in orderly arrangement so that they are ready for quick reference. File folders, properly labeled and indexed, are useful for this purpose. A book shelf and drawers for storing materials encourage neatness and systematic work. A typewriter may help some students to do more work in less time, but it is not necessary.

**Regular Habits.** Every human being is subject to habits, and the sum of his habits determines his character. The body and mind perform various functions more easily when they are taught to do so at regular intervals. For example, if we are accustomed to eating dinner at a certain hour, we normally become hungry at that time. Likewise, if a definite period of the day is set aside for study, the mind is more likely to be ready for study. The art of studying effectively can be acquired only with regular practice. If we neglect to study one day, it becomes that much easier to neglect to study on the next day.

**Reading Ability.** Effective study depends more than anything else on the ability to make the best use of the printed word. Rapid reading is essential in order to cover as much ground as possible without wasting time. The art of reading rapidly, and understanding what has been read, can be developed with practice. (See **READING**.) The student who has difficulty in reading should be given reading tests to determine the cause of his trouble.

The student cannot always determine immediately how helpful a book may be to the subject being studied. In that case, it is better to skim through the book quickly at first, instead of reading it word by word. In this way, the main points and general meaning are quickly grasped. If the material proves to be helpful, a second and more careful reading can follow.

Too many students fail to understand all that they have read because they do not know the meanings of some words. If a word is unfamiliar, it is a good habit to take time to look it up in the dictionary and learn its meaning. By analyzing the organization of material, a picture of what has been read can be formed in the mind. Try to grasp essential facts and sort these out in some kind of order. It is important to remember the

**A Dictionary Is Indispensable to Study** if the student is to understand the meaning of difficult words he reads.

idea, not the exact words in which the author has presented it.

Read critically in order to compare the statements of one author with those of another. A subject can often be presented from different points of view. The student should not form an opinion until the subject has been considered from more than one angle. Nor should he believe everything he sees in print without checking the facts against other authorities.

If there are questions at the end of a lesson or chapter, it is a good idea to try answering the questions *first*, on the basis of what you know. The actual reading of the lesson then becomes a process of checking and making certain the answers are correct.

**Studying Together.** Two or three students can often get good results and save a great deal of time by studying together. One interesting and effective method is for each student to prepare each day's lesson not by "studying" it, but by going through it rapidly in order to prepare a test or examination for the others. Each one then takes the test prepared by the others. The whole group scores its papers together. This does not take long and can be very helpful.

**Efficient Use of Text and Reference Books.** Text and reference books contain many aids to study. An index at the back of the book gives an alphabetical list of names and subjects referred to in the book. It also gives the pages where the topics may be found. The table of contents in the front of the book lists the chapters in sequence and often provides a brief description of what each contains. A bibliography is a list of other works about the subject. Sometimes a bibliography is found at the end of each chapter and sometimes at the end of the book. Charts, diagrams, and outlines should be studied because they are the author's means of summarizing information. Other aids are vocabulary lists, illustrations, maps, and notes, which often help to make an idea clear. Dictionaries and encyclopedias give cross references to other subjects where the information one needs may be found.

Cultivate the habit of using these aids to locate material quickly. Learn how to use such basic reference materials as an atlas, an almanac, and the card catalog in the library (see **LIBRARY**).

**Understanding the Assignment.** No subject can be

**The Globe Aids Study of Geography, History, and similar subjects by showing the exact location of various places.**

Photo: H. Armstrong Roberts





Press Syndicate

### An Up-to-Date, Comprehensive Encyclopedia Is an Invaluable Aid to Study

studied effectively unless the student has a clear understanding of the work he is supposed to do. Write out each day's assignment, and make a note of what is to be read, the problems to be worked out, and what must be prepared in writing. Ask the teacher to explain any points which are not clear. Take advantage of any directions or suggestions which are offered.

**Planning the Work.** The average student's time must be divided to cover several class periods as well as study periods. Study periods at school are generally assigned. But time for home study must be budgeted according to the work to be done. The student should not devote all his study time to one subject at the expense of another. Instead, make an over-all review of the work to be prepared for each class. Then allot the approximate amount of time necessary to complete each lesson. Keep the program flexible so that adjustments can be made in the schedule as they are needed.

Difficult subjects should be studied first while the mind is freshest. The easiest subjects should ordinarily be left to the last, unless you become inclined to pass them over too lightly just because they are easy.

**Taking Notes.** Cultivate the habit of taking notes in outline form both while reading and during classroom work. Notes provide a ready source of reference and they

also help you to fix a subject in mind. Do not attempt to write down every word you read or hear. Instead, learn to select essential facts and sum them up in the fewest possible words. To do this efficiently requires considerable practice. But a few words well chosen can serve as pegs on which to hang ideas. The process of reducing a subject to outline form will help considerably in learning to take notes.

Develop some system of filing notes so that they can be easily located when they are needed. No elaborate filing system is needed, but the exact method to use depends on the type of work being done. Perhaps all that is needed is a single folder for each subject. The notes may be placed in order alphabetically or according to date.

**Keeping Work Up to Date.** Nothing can be gained by putting off work from one day to another. You cannot study twice as hard in one day to make up for time lost during another. Each day's lesson must be prepared regularly for rapid progress. But sometimes you may miss work because of illness or for some other unavoidable reason. In that case, extra study time must often be allowed in order to bring the work up to date. Special assistance from your teachers or parents may be needed if you have missed a number of lessons.

**Concentration.** It is essential to keep in mind the subject to be studied. This can be accomplished only by mental discipline. The mind is often tempted to wander, sometimes even from an interesting subject. Mental discipline is a habit which can be cultivated only through constant effort. Concentration means that you must think only about the work at hand. If part of the mind is waiting for a telephone call or listening to the radio, the rest of the mind cannot fully concentrate on study.

Some subjects stimulate us naturally, and we enjoy studying them. Others may require a real effort of the will. But no subject need be dull if it is approached with a determination to master it. A subject sometimes only seems dull because we do not understand the reasons for studying it. After its purpose is explained, it may become very interesting.

Reference books often contain material other than that about the subject being studied. Sometimes such material may seem so interesting that we are distracted from the work at hand. This temptation must be vigorously resisted until the necessary tasks are accomplished. After the assignment is finished, it may be profitable to turn our attention to any subject we care to pursue. Investigation of this kind can be very stimulating to the mind. But to indulge in such relaxing reading before our work is done is as unwise a practice as eating candy before dinner.

**Frequent Review.** Each day's study should begin with a quick review of the previous lesson. This helps to fix in mind the points already learned and to form a bridge to the next assignment. All the work covered during a semester should be reviewed at regular and frequent intervals. Well-kept notes are very helpful for this purpose. Never wait until the day before an examination to review the work for an entire period. "Cramming" is the most inefficient method of study, and what is learned in this way is usually soon forgotten. After all, passing examinations is not the main purpose of study.

**Observation.** Not all study should be made from books. Everything about us is material for study. We can learn much about nature by reading books. But we can learn even more by observation. It is not enough merely to look. We may look without actually seeing. Instead, we must look carefully and think about what we see. Then we begin to wonder and to ask ourselves questions. The answers may be found in books or we may discover them for ourselves. Knowledge found in this way becomes a permanent part of us.

Museums offer rich sources of material for study. Some of them are mines of information about the past. History comes to life when we see actual examples of furniture, clothing, or painting and sculpture that were used or made by people in other times. If you are fortunate enough to be able to visit a *planetarium* where the stars and the heavens are studied, you may learn more about the universe in an hour than you could by studying a book for a week.

We can learn more about animals by studying live ones in zoos than by looking at pictures in books. And natural history museums present realistic exhibitions of stuffed animals in their natural settings, which zoos can seldom do.

**Application.** Study has much more meaning if what has been learned is applied to a practical purpose. For example, you might put arithmetic to use by offering to add and check the family grocery bill. A student of domestic science may be able to suggest improvements in the family's diet. All recreational activities offer opportunities to put into use something which has been learned in the classroom.

**Discussion and Self Tests.** We gain better understanding of a subject when we learn to express our ideas about it in our own words. This should be done both in writing and orally. Oral discussion stimulates quick thinking and a written analysis aids careful thinking. You should test your knowledge of a subject by asking yourself questions and then checking the answers with what you have already studied.

Discussions may take place in class. But they also may be continued outside of class with fellow students, members of the family, or older friends.

**Mental Attitude.** A happy outlook of mind helps you to study better. Worries or fear prevent concentration. The cause of a worry may exist only in your mind and can often be overcome by discussing it with parents or teachers. Fear of failing in your lessons can sometimes actually prevent effective study. But common sense and reason can help to dispel such fears. Seek the advice of parents and teachers or of someone in whom you have confidence. Faith in yourself is the best assurance of success.

A.G.R.

See also DICTIONARY; ENCYCLOPEDIA; OUTLINES AND OUTLINING; READING.

**STURGEON.** *STUR* *jun*, is the common name of a family of large fishes living in fresh waters and seas of the North Temperate Zone. They are caught for their flesh, which is usually smoked, and for their eggs, which are used in the preparation of caviar. A superior quality of isinglass is obtained from the air bladder of the Russian sturgeon. These fish have slender bodies covered with rows of bony plates. Beneath the long snout there is a small, toothless mouth with thick, sucking lips. There are four *barbels* or fleshy projections in front of the mouth. The head, like the body, is well protected with plates. A single dorsal fin rises from the back, and the body extends into the very long upper part of the tail fin. Most of these fish migrate from salt water into streams in the spawning season, but some species live permanently in fresh waters. Their food, consisting of small animals, is sucked into the mouth.

One of the best-known sturgeons is the *common sturgeon*. It lives in European waters and along the American coast from Maine to South Carolina. The largest specimens may be ten feet long and weigh about 1,000 pounds. The *white sturgeon* of the American Pacific coast is the largest American fish of this group. The *rock sturgeon* lives in the Great Lakes and the Mississippi Valley waters. The great Russian *beluga*, which sometimes reaches a weight of 3,000 pounds, has furnished the greater part of European caviar. Another Russian sturgeon, the small *stole*, also is the source of this delicacy. The North American sturgeons were extremely abundant in former times, but their numbers have been greatly decreased by overfishing.

G.L.H.C.

See also CAVIAR.



New York Zoological Society

**The Fresh-Water Rock Sturgeon** has its head and body armored with bony plates. Caviar is made from the eggs of its relative, the Russian sturgeon.

**Classification.** The common, white, and rock sturgeons are, respectively, species *sturio*, *transmontanus*, and *fulvescens* of the genus *Acipenser*. The beluga is *A. huso*; the sterlet, *A. ruthenus*. The sturgeon is one of the living members of the Ganoid family.

**STURGEON, WILLIAM** (1783-1850). See ELECTRO-MAGNET.

**STURLUSON.** See SNORRI STURLUSON.

**STURT, CHARLES** (1795-1869). See EXPLORATION AND DISCOVERY (Table of Famous Explorers [Inland Explorers]).

**STUTTERING.** See STAMMERING AND STUTTERING.

**STUTTGART, 'STUT' gahrt** (population 459,538), is the capital of the German province of Württemberg. The city is the center of the printing and book publishing industry of southern Germany. It lies about 115 miles northwest of Munich. Stuttgart was founded near the Neckar River, and is surrounded by beautiful hills covered with vineyards and woods. The city has several attractive suburbs, including Cannstatt on the Neckar. Many of the buildings in Stuttgart are fine examples of Renaissance architecture. There are numerous statues, parks, and gardens, and many fine churches and schools. Stuttgart was the birthplace of the German philosopher Georg Wilhelm Hegel.

Stuttgart was heavily bombed during World War II because it contained machine tool, ball bearing, and internal-combustion engine factories. Many of its famous buildings were damaged. French troops entered Stuttgart on April 22, 1945 and the city became part of the American zone of occupation after the German surrender.

H.V.B.K., Jr.

**STUYVESANT, 'STI veh sant, PETER** (1592-1672), was the last Dutch governor of colonial New York, or New Netherland, as it was then called. He was born in West Friesland, the son of a minister. He became a soldier as a young man, and in 1635 entered the service of the Dutch West India Company. In 1643 he went to the Leeward Islands as governor of Curaçao. The next year he led an attack against the island of Saint Martin and lost a leg in the battle.

In 1646 Stuyvesant was made governor of New Netherland. He arrived in New Amsterdam (now New York City) in May, 1647, and immediately began to make enemies by his harsh methods. But in spite of his severity, he restored order and business and made friends with the Indians. His settlement in 1650 with the New England colonists of the eastern boundaries of the Dutch colony angered the Dutch settlers because they thought he gave the Puritans too much territory. Five years later he

captured all of New Sweden, including the present state of Delaware, and made it a part of New Netherland.

Stuyvesant was jealous of his power and refused to give up any part of it. When a convention of Long Island citizens demanded a share in the government, he replied, "We derive our authority from God and the Company, and not from a few ignorant subjects." In 1664 an English fleet ordered the surrender of the city. The citizens refused to support Stuyvesant and he was forced to give in. Stuyvesant was sent to Holland in disgrace, but he returned to New York after a few years



The Travelers

**Peter Stuyvesant in New Amsterdam**, giving orders to the Dutch officials who worked with him. They are standing on Governor's Island in New York Harbor. Stuyvesant's stern rulings made him a very unpopular governor.

and settled down on his farm, or *bouwerij*, part of which later became the Bowery of New York City. Stuyvesant died on his estate and lies buried on the site of Saint Mark's Church. He is one of the main characters in Washington Irving's *Knickerbocker History of New York*.

See also BOWERY.

T.P.A.

**STY.** A sty is an infection of one of the small glands of the eyelid, usually around an eyelash. A sty is much like a small boil. It is caused by germs which enter the root of the eyelash, grow there, and form pus. Sometimes eyestrain is thought to cause stys. This is because people with eyestrain rub their eyes too much, infecting their own eyes with germs on their fingers.

The body usually kills the germs that cause a sty. Then the sty grows soft, bursts, lets out the pus, and heals. Hot moist applications held against the sty can help make it burst more quickly. There is another treatment which sometimes heals a sty before it grows soft. This is to pull out the hair that grows through it. The treatment is best left to a doctor.

Stys often come one after another. Doctors can make a vaccine from the germs and inoculate the person with it. Many cases of repeated stys have been cured by correcting eyestrain with glasses.

H.Bz.

See also BOIL.

**STYLE.** A distinctive manner or method of speaking, writing, or doing anything is called the *style* of it. In literature and the arts, style is the way thoughts or ideas are expressed, in order to show the spirit and feeling of the artist. See also DRESSMAKING; FASHION.

## STYLE

**STYLE**, in botany. See FLOWER (Pistil; illustration, Parts of a Flower).

**STYLUS**. The stylus was a sharp-pointed writing instrument used by the ancient Romans. It was made of metal, bone, or reed. The stylus was used to engrave characters on tablets of wax or moist clay. The cutting instrument which makes the grooves in a phonograph record, and the phonograph needle are called *styluses*.

**STYRIA**, *STIR ih ah*, is the name of a territory in Central Europe which covers an area of 6,323 square miles. At various times it has been a province in Austria-Hungary and in Austria. Graz is the chief city of Styria.

**STYX**, *stiks*, was a dark and dreary river in Greek and Roman mythology. Dead souls had to be carried across it by Charon in order to reach the Lower World. The gods took their most sacred oaths by the river Styx.

The kingdom of Pluto was on the other side of the Styx. After Pluto judged them, the dead souls were sent either to the happy Elysian Fields or to the dismal valley of Tartarus.

A high waterfall in Arcadia also was called the Styx. Its waters were thought to be poisonous, and people believed that the entrance to the Lower World lay behind it. P.Col.,

See also CHARON; ELYSIAN FIELDS; TARTARUS.

**SUAN PAN**, or **SWAN PAN**. See ABACUS.

**SUBCLAVIAN ARTERY**. See ARTERY; BODY, HUMAN (color plate, How the Blood Circulates).

**SUBCONSCIOUS**. Our behavior is *conscious* when we know what we are doing. But many motives, feelings, and impulses of which we are scarcely aware have an effect upon what we do. We perform many familiar acts, as we say, "without thinking." We call these acts *subconscious*. This does not mean that they are "unconscious," for we are often able to look back upon them and recall something we have done, or even why we did it.

For example, a man who can not find the keys to his automobile will try to trace his own subconscious behavior in the hope of remembering where he put them. No one could retrace his past actions if they had been *totally* unconscious. A person is dimly aware of what he does, even when he is paying almost no attention to it.

We do some things better when we do them subconsciously. For example, a person generally walks along the street more gracefully than he walks into a crowded church ten minutes late. Most of our acquired habits are given over to subconscious guidance. We can not tell how we know where to reach for the knob of a door unless we deliberately make a point of observing ourselves as we do these things.

Subconscious processes are at work constantly to make habits easier. Public speakers focus attention upon the ideas they wish to express, and the subconscious mechanisms take care of such habits as the formation and speaking of the words. Some persons talk in their sleep. This indicates the degree to which formation of speech sounds has become subconscious.

The subconscious plays its part in the field of sensation, in the field of memory, and in the organization of knowledge. Everyone has secret wishes, private hopes, and imaginative ambitions which form phases of character in conflict with the conscious life. Many of these

## SUBMARINE

are suppressed by social training and conditions. Hysterical cases of divided personality and inconsistency are only extreme cases of this relationship. W.S.S.

**Related Subjects.** The reader is also referred to:

Complex	Nightmare
Dream	Phobia
Freud, Sigmund	Psychoanalysis
Hypnotism	Sleepwalking
Kleptomania	Trance

**SUBHEAD.** See NEWSPAPER (Terms).

**SUBJECT.** See CITIZENSHIP (Citizen and Subject).

**SUBJECT**, in grammar. See SENTENCE (Parts of the Sentence).

**SUBLETTE**, *SUB let*, **WILLIAM LEWIS** (1799?-1845), was an American frontiersman who helped blaze the trail across the Western plains. He was born in Lincoln County, Kentucky. When he was about eighteen years old he moved to Saint Charles, Mo. In search of fortune, he joined a band of fur traders and pushed west over unknown country to the Rocky Mountains. In addition to natural hardships the band had to battle with unfriendly Indians. Later, Sublette was the first white man to drive wagons over the Great Plains to the Rockies. He set up trading posts on the Platte River and the Missouri River. Then he drove his wagon train back east, and sold his furs in his store in St. Louis. In this way he made his fortune. J.Cor.,

**SUBLIMATION**, *sub lih MA shun*, is the process by which a solid substance changes into a gas, or vapor, without first becoming a liquid. There are a few substances, such as iodine, arsenic, camphor, and dry ice, which change into a gas without first melting. These substances are said to *sublime*. The most familiar example of sublimation can occur when wet clothes are hung out on the line on a winter day when the temperature is below freezing. The water on the clothes freezes and then evaporates into vapor without melting. Solid iodine will change into a vapor when it is warmed without becoming a liquid. Then, when the vapor is cooled, the iodine will change back into crystals. This change of a vapor back into a solid also is part of sublimation.

Sublimation is used in industry to purify substances. When a solid changes directly into a vapor, only the pure substance evaporates and the impurities remain. Sulfur, benzoin, and sal ammoniac are made by this process. R.G.O.

See also EVAPORATION; VAPOR.

**SUBLIME PORTE.** See TURKEY.

**SUBMARINE**, *SUB mah reen*. As a weapon of war, the submarine was first widely used during World War I. The worth of a vessel which could hide beneath the surface of the sea and attack enemy warships and merchant ships was proved almost immediately. Submarines were of even greater importance during World War II. The United States Navy has estimated that 75 per cent of all damage inflicted on ships at sea during wartime has been the work of submarines. During World War II, submarines of the United States Navy were credited with sinking two out of every three large Japanese merchant ships that were sunk, and about one out of every three Japanese naval vessels that were destroyed.

Submarines may become even more important in the future. Some naval authorities believe that the adapta-



## SUBMARINE

tion of fleets to atomic warfare will require most ships to go below the surface.

### How a Submarine Operates

In shape, the submarine can best be compared with a cigar. It is tapered at both ends and is almost round, except for the slight keel at the bottom necessary for it to ride straight in the sea. The submarine has a double shell, or hull. The inner hull is built very strongly, to withstand the great pressure which is built up when the submarine dives below the surface. This pressure against the hull is 88.4 pounds per square inch of hull surface at a depth of 200 feet. The outer hull does not require great strength, since the space is largely filled with water, which equalizes the pressure from the sea.

Ballast tanks between these two hulls can be flooded with water or emptied of water by controls operated from within the submarine. Letting sea water in through valves operated by the controls sends the submarine downward. The submarine is brought to



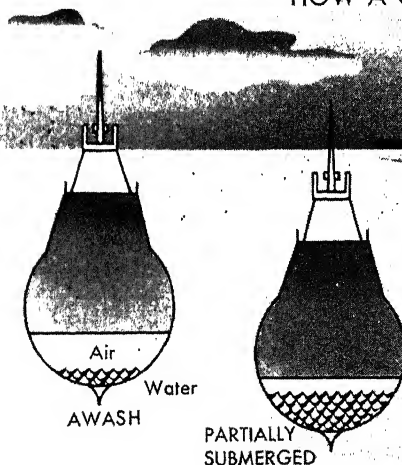
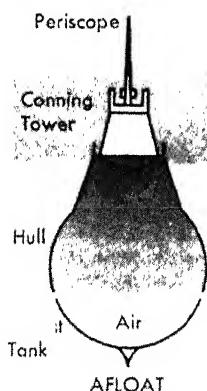
United States Navy

**The "Schnörkel" Used by German Submarines in World War II** was raised when the craft was under water. The tubelike device supported a float which rose to the surface and took in fresh air. This allowed the "sub" to go faster and to stay under longer.

the surface by emptying the ballast tanks. By reaching what is called *neutral buoyancy*, the submarine can be held in any position below the surface. The amount of ballast is accurately measured by the diving officer according to the number of men on board the submarine, the weight of the supplies, torpedoes, fuel oil, batteries, and other stores. A mistake in these calculations is dangerous, since the submarine may sink to a depth that will crush it if the ship becomes too heavy. The ballast tanks are distributed evenly about the ship so that the submarine will lie level in the water.

At each end of the submarine are large, finlike horizontal rudders, called *planes*. These planes may be rotated about their horizontal axis from the submarine's control station. With these planes, the diving officer can point the nose of the submarine up or down.

The periscope, with its reflecting mirrors, can be poked above the waters, allowing officers to see the surface of the sea while the sub-



PARTIALLY SUBMERGED



SUBMERGED

**A Submarine Floats** on top of the water because its ballast tanks are filled with air. At the order "Prepare to dive," the hatch is closed and the inlet valves are opened. Sea water flows into the ballast tanks, forcing out the air. The "sub" becomes heavier and gradually submerges. The depth of the dive can be regulated by controlling the amount of water in the tanks.

## HOW A SUBMARINE SUBMERGES

marine is cruising just below the surface of the water.

On the surface, the submarine is propelled by two screw propellers driven by Diesel engines. Such engines require an intake of air for their operation. For this reason, electric motors are used to turn the propellers when the submarine is submerged or underwater. The electrical energy for these motors is supplied by huge storage batteries of the lead-acid type.

The speed of the average submarine is about 20 knots on the surface and about 10 knots beneath the water. The largest submarines can travel about 16,000 miles before they need refueling.

### Life Aboard a Submarine

Submarine duty is dangerous and imposes great hardships on both officers and men. The operation of a submarine in wartime calls for cool-headed teamwork and courage of the highest order on the part of the crew. The space for living quarters in a submarine is very small. There is no opportunity for physical exercise, since the men must move about as little as possible in order to save oxygen. When a submarine has been submerged for a long time, the air becomes a disagreeable mixture of battery gas, fuel oil fumes, and body odor. The air must be tested from time to time in order to avoid an explosive mixture of gases. Submarine crewmen who are not on duty usually sleep or lie quietly in their bunks and read. Those on stations must be constantly on the alert and maintain silence. But in spite of the many hardships of submarine duty, the morale of the crews is usually very high and the men are proud of their branch of service.

### Development of the Submarine

**Early Efforts.** The first submarine was a leather-covered rowboat which Cornelius van Drebbel, a Dutch scientist, demonstrated in the Thames River in England about 1620. Van Drebbel operated his crude submarine at depths from ten to fifteen feet below the surface of the river.

In 1776, David Bushnell, an American colonist, developed the *Turtle*, a submarine that stood on end. It was operated by one man, and submerged by filling ballast tanks with water. An unsuccessful attempt to sink a British man-of-war in New York harbor was made with Bushnell's submarine during the Revolutionary War. This is the first record of a submarine attack on a war vessel.

Robert Fulton, who later developed the first financially successful steamboat, built the *Nautilus*, a copper-covered submarine twenty-one feet long, in 1800. Fulton tried to interest Napoleon in his submarine. But Napoleon was not impressed, although Fulton blew up a bridge with his man-operated ship in a demonstration on the Seine River in France.

During the War between the States, the Confederate Navy developed several submarines called *Davids*, which could submerge for only a few moments at a time. One of these made the first successful attack on a warship in Charleston harbor in 1864. A torpedo was tied to a spar on the submarine, which then rammed the Union corvette *Housatonic*. Both submarine and ship sank after the explosion.

The first submarine commissioned in the United States Navy was the *Holland*, named for its designer and builder, John P. Holland. The *Holland*, launched in 1900, was 53 feet long and displaced 75 tons. It was propelled by a gasoline motor on the surface and by an electric motor when submerged. It had a torpedo tube in the bow, but no periscope. The speed of the *Holland* on the surface was about seven knots, and its cruising range was 1,500 miles. The success of the *Holland* in maneuvers led to the building of other submarines. In 1906, the Diesel engine was adapted to submarines.

**During World War I**, the German Navy developed submarines called *U-boats*, which fired torpedoes that propelled themselves through the water after leaving the torpedo tubes. The first war vessel to be sunk by such a torpedo was the British *Pathfinder*, which went down in 1914. Later, the Germans began to use the U-boats against merchant ships and passenger vessels. The U-24 sank the French steamer *Admiral Ganteaume*, carrying 2,500 Belgian refugees, off Griz Nez in 1914. The United States was drawn into the war partly as the result of the U-boat. Public feeling against the Germans ran high when the *Lusitania*, a British vessel, was torpedoed in the Atlantic in May, 1915, and 1,198 persons lost their lives, including many Americans.

**In World War II**, submarine fleets were built by all the warring nations. The Germans again filled the Atlantic with submarines to blockade shipping. But the United States Navy developed fast ships called subchasers which rid the sea of most of the Nazi undersea raiders. The development of radar also aided in the location and destruction of German submarines. Supply ships also were given the protection of convoys of warships especially equipped to deal with submarines. The Japanese used midget submarines, carrying a crew of only two men, in their surprise attack on Pearl Harbor, Hawaii. The Japanese also developed especially large submarines, which could make long voyages without refueling or resupplying. Somewhat smaller submarines were developed by the United States Navy.

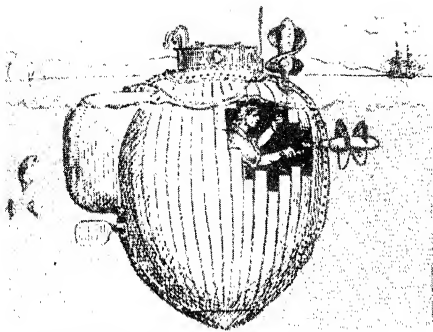
The exploits of United States submarines in World War II were sometimes spectacular. The USS *Barb* sank or damaged almost a quarter of a million tons of enemy shipping in twelve raids, in the Pacific theater of war.

The *Barb* was the first submarine to use rockets, and the first one whose crew blew up a railroad train. It also is generally credited with firing the most valuable six-torpedo salvo in the history of the navy. The salvo sank a 22,500-ton Japanese carrier and a 11,700-ton gasoline tanker fully loaded.

The railroad train was blown up by several crew members of the *Barb* who rowed to the shore of one of the Japanese islands in rubber boats.

The rockets fired by the *Barb* succeeded in causing heavy damage to several Japanese industrial installations on land.

The *Schmidt* was an important development in submarine operation which was put into use by the German Navy toward the close of the war. This device is a long tube which permits the submarine to "breathe" under water. The tube supports a small float on the surface of the water which takes in a constant supply of oxygen. The submerged submarine can then use its



**It's Turtle** was one of the first attempted to sink British warships.

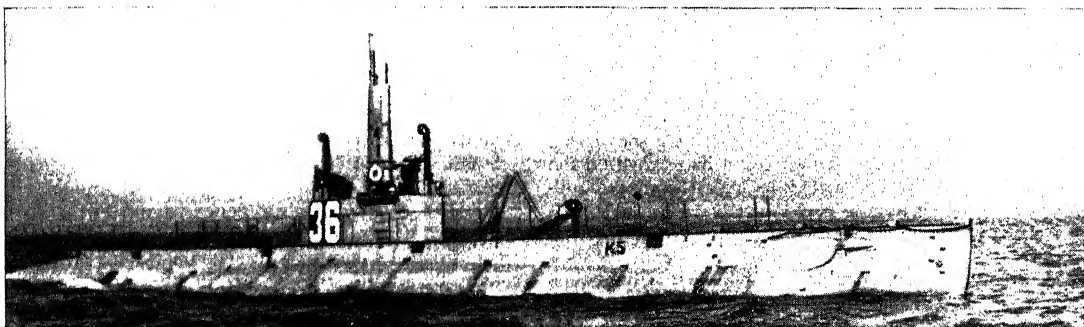
## DEVELOPMENT OF THE AMERICAN SUBMARINE



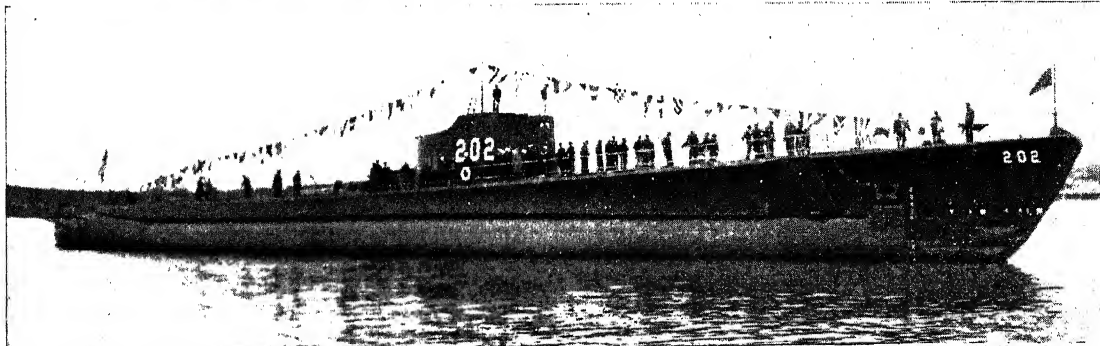
In **John Holland's Fenian Ram** was launched in 1881. It sank after a collision, but its success led the U.S. Navy to grant Holland a contract.



**The First United States Navy Submarine Was Built by John Holland and Commissioned in 1900**



**The World War I American Submarine Proved Its Military Value by Sinking Many Enemy Warships**

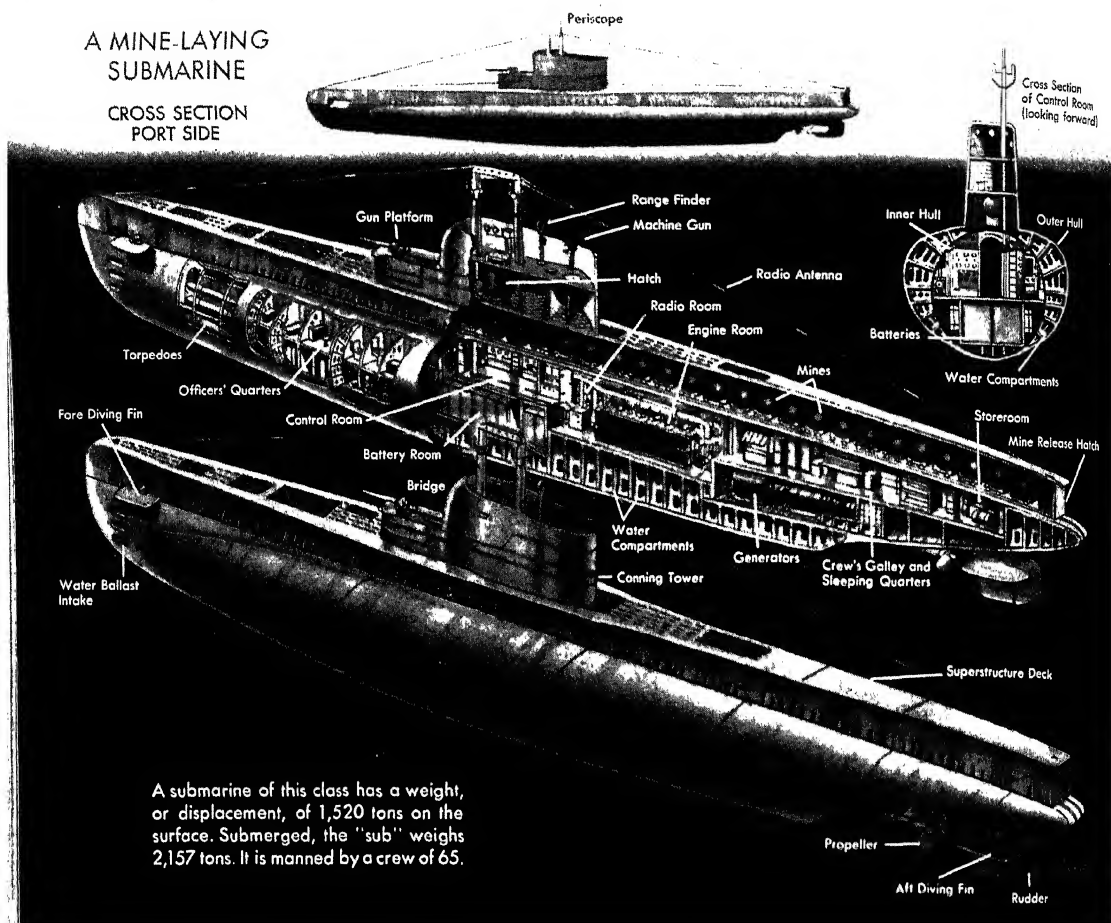


Brown Bros., U.S. Navy, Acme

**The World War II American Submarine Was An Effective Naval Weapon in the Pacific Ocean**

## A MINE-LAYING SUBMARINE

CROSS SECTION  
PORT SIDE



A submarine of this class has a weight, or displacement, of 1,520 tons on the surface. Submerged, the "sub" weighs 2,157 tons. It is manned by a crew of 65.

Diesel engines, which require oxygen to operate. Before the development of the Schnörkel, submarines had to use electric motors under water. This cut their speed to about half of that which could be reached on the surface with Diesel engines. Schnörkel-equipped submarines were able to stay under water for as long as forty-one days, and achieved an underwater speed of 18 knots because they were able to operate on their Diesel engines. This is the closest to the true submarine, or vessel that can remain submerged for any desired length of time, that submarine designers believe to be possible for the present.

R.COIL.

**Related Subjects.** The reader is also referred to:

Convoy	Mine Layer
Depth Charge	Navy (Names of Naval Ships)
Detector, Sonar	Periscope
Holland, John Philip	Torpedo

**SUBMARINE CABLE.** See CABLE, SUBMARINE.

**SUBMARINE MINE.** See MINE, MILITARY.

**SUBOTICA.** See YUGOSLAVIA (Cities).

**SUBPOENA**, *sub PE nah*, is a written notice to appear and give testimony in court. The name comes from two Latin words, *sub*, which means *under*, and *poena*, which means *penalty*. A person who receives a subpoena must obey the command *under penalty* of being held in contempt of court. (See CONTEMPT.) The *subpoena duces tecum* (Latin for *bring with you under penalty*) requires a

person to bring into court with him certain specified things, such as papers, books, financial records, or other exhibits. See also WITNESS.

H.CAL.

**SUBSCRIPTION LIBRARY.** See LIBRARY (Subscription Libraries).

**SUBSIDY**, *SI B sih dih*, is a money payment or other form of aid which the government gives to a person or organization. Its purpose is to encourage some needed activity by furnishing funds, free land, or legal rights which might be lacking, or which the person or organization might not have capital to cover.

In the 1800's, the United States Government gave large tracts of public land to the railroads on condition that they would build lines across the continent. Altogether, the railroads received nearly 160,000,000 acres of land in this way. During this period the government also granted subsidies to aid telegraph and cable companies.

In the 1920's, another form of subsidy aided shipping companies. The government granted ship companies generous mail-carrying contracts which would yield them a satisfactory profit. The government also allowed shipping companies to buy government-owned ships at about a tenth of their actual cost. The air lines also have been aided by subsidies in the form of generous mail contracts. Farmers and food processors have been granted subsidies for the production of certain foods.

## SUBSTRUCTURE

## SUBTRACTION

This measure was adopted to stimulate production and to lower the market price of these foods.

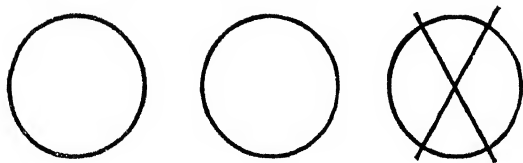
Subsidies may be of great benefit to a country if they are granted wisely. Food prices would have risen much more rapidly than they did during World War II if subsidies had not been used. But subsidies are subject to abuse, because a government may be overgenerous in its grants.

R.D.P.

**SUBSTRUCTURE.** See BUILDING CONSTRUCTION.

**SUBTRACTION** is the act of taking one number away from another number, or, as some people say, taking one number *out* of another. Subtraction shows the *difference* between two numbers.

**Subtracting with Pennies.** Get three pennies and place them together on a table or desk. Take one penny away and put it in your pocket. You have now *subtracted* one from three. Count how many pennies are left on the table. There are two left. Two is the right answer as it is the *difference* between one and three.



**Subtracting by Thinking.** Take the penny out of your pocket and put it back on the table with the other two. Without picking up any pennies how many would you have if you subtracted two from three? You know the answer is *one* without counting the pennies.



This is subtracting by “thinking.” It is quicker and easier than counting objects and then taking some away.

If Tom has five pennies and spends three for candy, how many would he have? He could find the answer without taking the pennies from his pocket and counting them. He could *think* that *three* taken away from *five* is *two*.

**The Subtraction Sign.** The sign to take away one number from another, or subtract, is called the *minus* sign and is shown like this —  $-$ . Tom could show that he subtracted three from five by writing:

$$\bigcirc\bigcirc\bigcirc\bigcirc\bigcirc - \bigcirc\bigcirc\bigcirc = \bigcirc\bigcirc$$

But Tom did not have to count his pennies or draw pictures of them to find out how many he had. He wrote out the figures  $5-3$  and then got the answer, 2, by thinking. He then showed the answer,  $5-3=2$ . Or, he could have written it like this: 5

$$\begin{array}{r} 5 \\ -3 \\ \hline 2 \end{array}$$

**Subtraction Problems.** Mary has nine pennies and John has five pennies. How many more pennies has Mary than John?

To find the answer, five must be subtracted from nine,  $9-5=?$  If you have trouble *thinking* the answer, look at the following figure:

Mary's Pennies ○○○○○○○○○

### John's Pennies

Mary has four more than John, or  $9 - 5 = 4$ .

**Names of the Numbers in Subtraction.** In the problem you just worked, and in every subtraction problem, each number has a name. We have already said that the answer is the *difference*, or *remainder*. Four is the difference in this problem. The number subtracted, or five in this case, is called the *subtrahend*. The number out of which the subtrahend is taken, or nine in this problem, is called the *minuend*.

$$\begin{array}{r} 9 - \text{minuend} \\ -5 - \text{subtrahend} \\ \hline 4 - \text{difference, or remainder} \end{array}$$

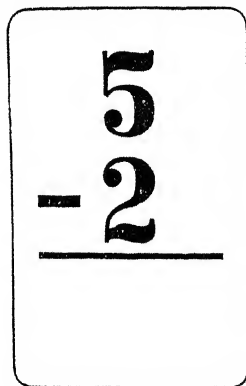
**Addition and Subtraction** go hand in hand. Subtraction may be thought of as being, and usually is, the opposite of addition. Addition is like counting one group in with another one. Subtraction is like counting one group out of, or away from, another one.

**Learning Subtraction by the Table.** It takes a lot of work and study to learn to subtract. One of the things that will help you is the subtraction table. This is a list of subtraction combinations of numbers with differences of 9 or less. There are 81 subtractions in the table. Notice the subtractions to the left of the heavy crooked line. These are the 45 easy subtractions. These 45 subtractions can easily be counted, or thought, just as “five minus three are two” could be counted, or thought.

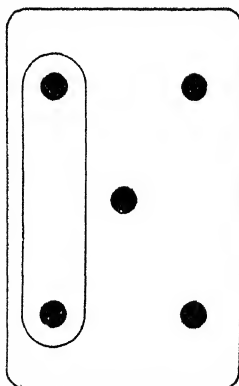
<u>2</u> <u>1</u>	<u>3</u> <u>1</u>	<u>4</u> <u>1</u>	<u>5</u> <u>1</u>	<u>6</u> <u>1</u>	<u>7</u> <u>1</u>	<u>8</u> <u>1</u>	<u>9</u> <u>1</u>	<u>10</u> <u>1</u>
<u>3</u> <u>2</u>	<u>4</u> <u>2</u>	<u>5</u> <u>2</u>	<u>6</u> <u>2</u>	<u>7</u> <u>2</u>	<u>8</u> <u>2</u>	<u>9</u> <u>2</u>	<u>10</u> <u>2</u>	<u>11</u> <u>2</u>
<u>4</u> <u>3</u>	<u>5</u> <u>3</u>	<u>6</u> <u>3</u>	<u>7</u> <u>3</u>	<u>8</u> <u>3</u>	<u>9</u> <u>3</u>	<u>10</u> <u>3</u>	<u>11</u> <u>3</u>	<u>12</u> <u>3</u>
<u>5</u> <u>4</u>	<u>6</u> <u>4</u>	<u>7</u> <u>4</u>	<u>8</u> <u>4</u>	<u>9</u> <u>4</u>	<u>10</u> <u>4</u>	<u>11</u> <u>4</u>	<u>12</u> <u>4</u>	<u>13</u> <u>4</u>
<u>6</u> <u>5</u>	<u>7</u> <u>5</u>	<u>8</u> <u>5</u>	<u>9</u> <u>5</u>	<u>10</u> <u>5</u>	<u>11</u> <u>5</u>	<u>12</u> <u>5</u>	<u>13</u> <u>5</u>	<u>14</u> <u>5</u>
<u>7</u> <u>6</u>	<u>8</u> <u>6</u>	<u>9</u> <u>6</u>	<u>10</u> <u>6</u>	<u>11</u> <u>6</u>	<u>12</u> <u>6</u>	<u>13</u> <u>6</u>	<u>14</u> <u>6</u>	<u>15</u> <u>6</u>
<u>8</u> <u>7</u>	<u>9</u> <u>7</u>	<u>10</u> <u>7</u>	<u>11</u> <u>7</u>	<u>12</u> <u>7</u>	<u>13</u> <u>7</u>	<u>14</u> <u>7</u>	<u>15</u> <u>7</u>	<u>16</u> <u>7</u>
<u>9</u> <u>8</u>	<u>10</u> <u>8</u>	<u>11</u> <u>8</u>	<u>12</u> <u>8</u>	<u>13</u> <u>8</u>	<u>14</u> <u>8</u>	<u>15</u> <u>8</u>	<u>16</u> <u>8</u>	<u>17</u> <u>8</u>
<u>10</u> <u>9</u>	<u>11</u> <u>9</u>	<u>12</u> <u>9</u>	<u>13</u> <u>9</u>	<u>14</u> <u>9</u>	<u>15</u> <u>9</u>	<u>16</u> <u>9</u>	<u>17</u> <u>9</u>	<u>18</u> <u>9</u>



Cards may be made to help learn the answer to these subtraction problems. The subtraction problems or questions should be written, as  $5-2$ , on the front of the card. The picture answer, or remainder, is shown on the back. If you are not sure of the answer to the problem on the front of the card, study how to find the answer on the back.



Front

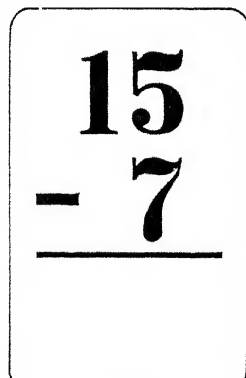


Back

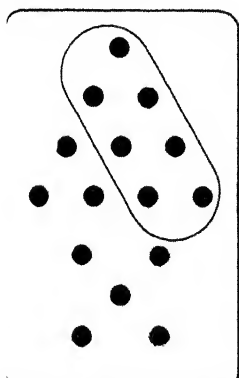
**The Harder Subtractions.** There are 36 other subtractions besides the 45 easy ones on the table. Notice the 36 problems to the right of the heavy crooked line in the table. The differences in these subtractions are from 2 to 9, and the minuends are from 11 to 18. It might help you learn these harder problems by studying the addition of numbers to make the larger minuends. (See the article ADDITION, for the addition table.) For example, in addition, you know that seven and eight make a sum of fifteen. This makes it easy to remember that  $15-7=8$ , or  $15-8=7$ .

To become more sure of these answers, you can learn a special way of working out these subtractions. For example, the subtraction nine from thirteen ( $13-9$ ). You know from your study of addition that 13 is the same as 10 and 3. You can work and think that 9 from 10 is 1, and that 1 can be added to the 3 to give 4. Thus 13 minus 9 is 4.

The answers to even these larger figures also can be placed on cards like those described. Many of these cards can be made up from the subtraction table and used by you and your friends to play a game to see who can get the greatest number of correct answers.



Front



Back

**Subtracting Double Figures.** From your work in addition, you already know about writing tens and larger figures. You know that tens must be put in ten's place in the figure, and you know how to use a "zero" to hold a place. (See ADDITION [Adding Tens]). It is just as easy to subtract double figures, or tens, as it is to subtract ones. Suppose each number in the subtraction table has a zero beside it. For example, 40

$$\begin{array}{r} 40 \\ - 30 \\ \hline 10 \end{array}$$

To subtract, show the zero in its proper place in the remainder, just below the other two zeros in the one's column. Then subtract the numbers in the ten's column ( $4-3$ ) and place this number (1) in front of the zero in the answer. You now have the difference between 40 and 30. It is 10.

Suppose there are two numbers like this:  $74-20$

$$\begin{array}{r} 74 \\ - 20 \\ \hline \end{array}$$

Remember that zero means nothing. If you have four pennies when you start to school in the morning and do not spend any all day, how many pennies do you have when you come home in the afternoon? Do you not still have four? The zero simply holds the place in the column. Carry the 4 down to the answer and subtract the ten's column the usual way,  $7-2=5$

$$\begin{array}{r} 74 \\ - 20 \\ \hline 54 \end{array}$$

Now work out the following problems in subtraction.

$$\begin{array}{r} 50 \\ - 20 \\ \hline \end{array} \quad \begin{array}{r} 150 \\ - 70 \\ \hline \end{array} \quad \begin{array}{r} 55 \\ - 22 \\ \hline \end{array} \quad \begin{array}{r} 158 \\ - 98 \\ \hline \end{array}$$

You probably had no trouble getting the correct remainders if you followed the simple rules given above. In the last problem, the answer in the one's column is zero. Do not let the  $8-8$  confuse you. If you have eight cookies and eat them all, how many do you have left? But you must put the zero down in the answer column to hold the place and put the tens answer in ten's place. The answers are  $50-20=30$ ;  $150-70=80$ ;  $55-22=33$ ; and  $158-98=60$ .

**Hundreds and Thousands** are subtracted just as ones and tens are subtracted. Remember to start with the one's column and work to the left.

$$\begin{array}{r} 1. \quad 500 \\ - 200 \\ \hline \end{array} \quad \begin{array}{r} 2. \quad 5000 \\ - 2000 \\ \hline \end{array} \quad \begin{array}{r} 3. \quad 1297 \\ - 642 \\ \hline \end{array} \quad \begin{array}{r} 4. \quad 5873 \\ - 2670 \\ \hline \end{array}$$

The answers are 1, 300; 2, 3000; 3, 655; 4, 3203

**Using a Ten in Subtraction.** We now come to those subtractions which require what is usually called "borrowing." This method uses a ten from the next column. It is used when the number in the minuend column is smaller than the number below it in the subtrahend. To show how it works, subtract 29 from 56. In the figure 56 we have 5 tens and 6 ones.

5 Tens

6 Ones

The problem is to take away 29, or 2 tens and 9 ones from 56. We must first take away 9 ones. 56

But we notice that there are only 6 ones in the number 56 in the minuend. We cannot take 9 from 6, so we "use a ten" from the group of 5 tens. We add it to the 6 ones and we have 16. 9 from 16 is 7, so seven is the first number to put in the answer.

$$\begin{array}{r} 56 \\ -29 \\ \hline 27 \end{array}$$

Moving to the second, or ten's column, one ten has been used, and only 4 tens remain. 2 tens from 4 tens is 2 tens. The answer is now 2 tens and 7 ones.

$$\begin{array}{r} 56 \\ -29 \\ \hline 27 \end{array}$$

2 Tens Taken  
2 Tens Left

9 Ones Taken  
1 One Left

2 tens taken from 4 tens  
is 2 tens (or 20).

The used ten plus  
6 ones is 16.  $16 - 9 = 7$ .

The practice of using a ten is the same when there are no ones in the minuend. For example,

$$\begin{array}{r} 60 \\ -23 \\ \hline \end{array}$$

2 Tens Taken from Remaining  
5 Tens; 3 Tens Left

3 Ones Taken From One  
of 6 Tens; 7 Ones Left

or,

$$\begin{array}{r} 60 \\ -23 \\ \hline 37 \end{array}$$

**The Cross-out Line.** One of the best ways to show that a ten has been used is to use the "cross-out" line. In the first example of using a ten we had 56. To show

$$\begin{array}{r} 56 \\ -29 \\ \hline 27 \end{array}$$

that a ten has been used, cross out the 5 (~~5~~) and write a four above it. Then just imagine carrying the ten over to the 6 to make 16. The problem would then look like this: 4 The second problem would be:

$$\begin{array}{r} 46 \\ -29 \\ \hline 17 \end{array}$$

$$\begin{array}{r} 50 \\ -23 \\ \hline 27 \end{array}$$

The cross-out line can be a big help if you understand its use and are thoughtful in the work. Very quickly you will be able to throw away this "crutch," or cross-out line, and use a ten by just thinking about it.

The principle of using a ten also can be used in subtracting hundreds and thousands. Thus, if a hundred needs to be used in subtracting, it is just as though it were a ten.

$$\begin{array}{r} 6 \\ 974 \\ -385 \\ \hline 589 \end{array}$$

$$\begin{array}{r} 25 \\ 389 \end{array}$$

$$\begin{array}{r} 13 \\ 2,744 \\ -1,187 \\ \hline 1,057 \end{array}$$

$$\begin{array}{r} 35 \\ 34,643 \\ -21,650 \\ \hline 12,993 \end{array}$$

Using a ten is especially helpful in the subtractions that have zeros in the minuend. Thus, in the problems  $706 - 427$  and  $7,000 - 4,269$ , we need to use a ten to begin work in each case. But do we have a ten to use? In the first example, there are 70 tens, and after borrowing one we have 69. In the second, we have 700 tens, and borrow one to leave 699.

$$\begin{array}{r} 69 \quad 699 \\ 706 \quad 7,000 \\ -427 \quad -4,269 \\ \hline 279 \quad 2,731 \end{array}$$

**Subtracting Sums of Money.** Sums of money may be subtracted as easily as any other figures. Suppose that you have saved \$4.19 and want to buy a football for \$1.76. How much money would you have left? Would you have enough left over to buy a helmet that cost \$2.55? You have the right answer if you know that you need to save 12 more cents to buy both articles. The important thing to remember in subtracting sums of money is to drop the decimal in the subtrahend and minuend straight down to the answer just as you learned in addition.

**Checking the Answers.** One of the best ways to find out if you have the correct answer is to work the problem over again and see if the two answers are the same. Another way to check your subtraction is to add the difference to the subtrahend. These two added together should always give the minuend. For example,

$$\begin{array}{r} 9 \quad 249 \quad 87,112 \\ -7 \quad -136 \quad -23,126 \\ \hline 2 \text{ answer} \quad 113 \text{ answer} \quad 63,986 \text{ answer} \\ +7 \quad +136 \quad +23,126 \\ \hline 9 \text{ check} \quad 249 \text{ check} \quad 87,112 \text{ check} \end{array}$$

**Home Help.** At home, Mother or Father may do much to help in learning subtraction. There are more things to compare and subtract than there are in school. You may work with pennies or other coins, blocks, cards, and many different materials. H.G.W.

See also ABACUS.

**SUBWAY.** A subway is an underground railway. In cities like New York City, London, Paris, and Moscow, the subway system is a great complicated network of tunnels under the city. London was the first city to have a subway, and now has five systems giving quick and cheap transportation to all parts of the city and suburbs. The London subways are called "tubes." Some of them are so far underground that passengers descend to them on elevators.

Madrid opened a short subway in 1919 and Barcelona in 1924. The subway in Sydney, Australia, was completed in 1926. In South America, Buenos Aires has a subway dating from 1928. Moscow's beautiful subway was opened in 1935. Tokyo's system was opened in 1927. In the United States, New York City, Boston, Philadelphia, and Chicago have subways. Boston was the first American city to have a subway, opening its line of one and a half miles in 1898. The one in New York City is the largest in the world, and is probably the best example of passenger-subway construction. The first sections of the New York subway were opened for business in 1904. Chicago has a freight subway about seventy miles long, under the central business district.



**A Woman Guard in the Moscow Subway** signals for the sleek steel train to leave. The subway in the Soviet capital was completed in 1935.



**A Train Rolls** into a station of Chicago's underground system.

A passenger subway system of eight and three-quarters miles was begun in 1938. The first section of about five miles was opened in 1943.

**Subway Construction.** There are two methods of building a subway. One is called the "open cut." The streets are torn out and the subways are built in deep ditches. Then pavement is laid over the subway again. The tunnels of an open cut subway are rectangular in form. If one line crosses another, one roadbed must be much deeper than the other so it can pass under the other.

The other form of subway is constructed by boring through the earth at the desired depth without disturbing the surface. This type of construction is for one or two tracks. The tunnel is usually circular or semicircular in shape. New York City's subway is rectangular, while the London "tube" is semicircular. Subways must be built so that ventilation is good. Stale air is carried off through vents. Fresh air may be brought into the system by means of fans.

The first metropolitan subway built in London was operated by steam locomotives, and was opened in 1863. The first deep-level "tube" was opened in 1890, and had electric locomotives. All subways since that time have been operated by electricity. The cost of construction is very high. The New York City system cost between \$2,000,000 and \$3,000,000 a mile. This system is so large that one may travel from the New Jersey shore, under the city, beneath two rivers into Long Island, without once seeing daylight. F.M.R.

See also **ELECTRIC RAILROAD; TUNNEL.**

**SUCCESSION WARS.** Wars growing out of disputes over who should inherit, or *succeed to*, a throne are called *succession wars*. Four important conflicts in modern European history are known by this name. They are the War of the Spanish Succession, the War of the Polish Succession, the War of the Austrian Succession, and the War of the Bavarian Succession.

**The War of the Spanish Succession** began in 1701 and lasted until 1714. Its American phase was known as Queen Anne's War.

Charles II, king of Spain, had no children, and all Europe was interested in the question of who would be

his successor. The laws governing succession were so involved, and the claims of the different heirs were so conflicting, that it is almost impossible to say who rightfully should have worn the Spanish crown.

When King Charles II died in Spain on November 1, 1700, he left a will which gave the crown to the French prince, Philip of Anjou. Louis XIV of France then proclaimed his grandson king of Spain, and declared that the Pyrenees no longer separated the two kingdoms. All Europe was alarmed at the prospect of the annexation of the Spanish Empire to France, for French power was already feared in Europe.

Almost immediately the Grand Alliance was formed by England, The Netherlands, Prussia, Austria, and most of the other states of the Holy Roman Empire. This alliance aimed to prevent Philip of Anjou from becoming king of Spain, and to put the Archduke Charles of Austria on the throne instead. War broke out between France and the Grand Alliance. The French were defeated decisively in the battles of Blenheim, Ramillies, Oudenarde, and Malplaquet by the forces of the Grand Alliance commanded by two great generals, the English Duke of Marlborough and Prince Eugene of Savoy.

In 1711 Emperor Joseph I of Austria died. His successor was his brother, the Archduke Charles, who was the allies' candidate for the Spanish throne. Immediately it became clear that the balance of power would be even more seriously threatened if Charles got Spain as well as Austria than it would be if Philip became King of Spain. Charles as Emperor of Austria would be placed in a position where he would control Spain as well as the Holy Roman Empire. In 1713 Louis XIV used skillful diplomacy to bring about the Peace of Utrecht, under which he obtained fairly favorable terms. His grandson, Philip, was recognized as King of Spain on the condition that Spain and France would never be united. The Austrian emperor refused to sign the Treaty of Utrecht and did not make peace until a year later. Then he found it necessary to give way and sign the Treaty of Rastatt, which was almost exactly the same as the Peace of Utrecht.

**The War of the Polish Succession** (1733-1735) was

caused when Polish nobles elected Stanislaus Leszczyński, father-in-law of Louis XV of France, as king of Poland. Russia and Saxony forced the Poles to accept the Elector Augustus of Saxony as king. War followed between France, aided by Spain, and Russia, aided by Austria. The outcome was a damaging blow to French prestige. Augustus remained king of Poland.

**The War of the Austrian Succession** (1740-1748) was known in America as King George's War. It was caused by the death of the Austrian Emperor Charles VI, who left his daughter Maria Theresa as heir to his dominions. The great powers of Europe had guaranteed her succession to the Austrian throne by the Pragmatic Sanction, but they broke their pledged word and attempted to take Maria Theresa's inheritance away from her. See PRAGMATIC SANCTION.

The first to attack Maria Theresa was Frederick the Great, king of Prussia, who conquered the province of Silesia. In 1741 he strengthened his hold upon the territory by an overwhelming victory at Mollwitz. France, Spain, Bavaria, Saxony, Sardinia, and Poland joined Prussia, and for a time Maria Theresa was threatened with the loss of her dominions. But she contrived to save her crown and most of her lands by her own great courage and vigorous leadership. Her appeal to the Hungarians won her the powerful support of this chivalrous people. Maria Theresa was further aided by an alliance with the great maritime powers, England and Holland, which crushed the power of France at sea. She separated Frederick the Great from his allies by giving him Silesia. The Treaty of Aix-la-Chapelle, signed in 1748, finally ended the war.

**The War of the Bavarian Succession** (1777-1779) was a short quarrel between Prussia and Austria over the succession to the throne of Bavaria and the disposition of some Bavarian territory. In 1777 the Elector of Bavaria, Maximilian Joseph, died and left no direct heirs. Austria then attempted to control the affairs of Bavaria and to dictate the succession. This aroused the jealousy of the ever-watchful Frederick the Great. Both Prussia and Austria invaded Bavaria with their armies, and a bloody war seemed inevitable.

But neither Austria nor Prussia was anxious for war. France and Russia diplomatically mediated and secured peace. In the Treaty of Teschen, signed in 1779, both Austria and Prussia were satisfied by certain territorial gains.

J.S.S.

**Related Subjects.** The reader is also referred to:  
 Aix-la-Chapelle, Treaties of Louis (XIV, France)  
 Blenheim, Battle of Maria Theresa  
 Charles (VI, Holy Roman Marlborough, Duke of  
 Empire) Seven Years' War  
 French and Indian Wars Utrecht, Peace of  
 (Queen Anne's War and  
 King George's War)

**SUCCORY**, *SUK'oh rih*, is another name for chicory. See CICHORY.

**SUCCOTH, OF SUKKOTH.** See TABERNACLES, FEAST OF.

**SUCCULENT**, *SUK'yoo lent*, is the name for a fleshy plant, such as the cactus, which has large stems or leaves in which to store water. Succulent plants are found in the deserts and other dry places in the world where there is not much water available. Desert plants have large stems or leaves in which to store water.

lants often have very odd shapes.

ps the best known succulent that stores its water in the stems. It has a thick stem and very tiny leaves that look and feel like thorns. Plants that store



J. Horace McFarland

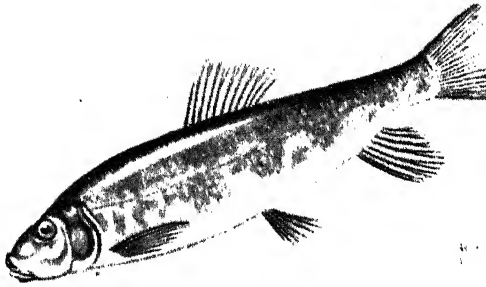
#### Sedum Is an Example of a Succulent Plant

water in their leaves are *hen-and-chickens*, *stonecrops*, and *iceplants*. Plants that store water in their leaves sometimes look like stones on the ground. The *Living Rock* of South Africa is an example of this type of succulent. Other succulents have leaves that look like tiny beads on a long slim stem, especially the sedums.

Succulent plants grow wild in the western part of North America, in certain parts of Africa, and in Central Asia. Many of these succulents are grown as house plants. They require very little care and very little water. Many of them have bright, colorful flowers. A.C.H.O.

See also CACTUS; DANDELION; MILKWEED; SPURGE FAMILY.

**SUCKER** is the name given to several kinds of fish closely related to the minnow family. Most of them have mouths with thick fleshy lips, which are fitted to sucking up the animal and plant life that grows on the bottom of lakes and streams. Except for a few kinds in eastern Asia, all the suckers are native to North America. These fish are dull-colored except in the spring, when the males of some species have a rose or orange stripe. The larger kinds are food fishes of increasing commercial importance. The flesh is sweet, but somewhat bony. In the Mississippi Valley the large, carplike suckers known as buffalo fishes are caught and sold in large quantities.



The **White Sucker** has thick lips on the underside of the snout. Its mouth has no teeth, but its throat is lined with thin, comblike spines. Suckers live in lakes and streams.

**Classification.** The common sucker is *Catostomus commersoni*. The bigmouth buffalo fish is *Megastomus cyprinella*; the smallmouth buffalo fish, *Ictiobus bubalus*; the black buffalo fish, *I. niger*.

**SUCKER STATE.** See ILLINOIS.

**SUCKLING, JOHN, SIR** (1609-1642), was an English lyric poet and playwright. He often staged lavish productions of his own plays at the court of Charles I, where he was famous for his wit, bravado, and spendthrift habits. Suckling is credited with having invented the game of cribbage. He was born at Whitton, Middlesex, and was educated at Cambridge University. He fought under the Swedish king, Gustavus Adolphus, and gave large sums of money to support Charles I in the conflict with Oliver Cromwell. Suckling was later accused of taking part in the plot to release the Earl of Strafford from the Tower of London, and fled to Paris. Little is known about his later life, but it is believed he finally poisoned himself. J.Au.

**His Works** include the poems "Why So Pale and Wan, Fond Lover"; "A Ballad Upon a Wedding"; and "I Prithce Send Me Back My Heart."

**SUCRE.** See BOLIVIA (Cities).

**SUCRE, SOO kray**, is a standard coin in Ecuador. In normal times its value is about forty-nine cents in United States money. It is named after the South American patriot, Antonio José de Sucre (1795-1830). J.Gor.

**SUCRE, ANTONIO JOSÉ DE** (1795-1830), was the liberator of Bolivia and Ecuador. He was also Bolivia's first President. He rivals Simón Bolívar in fame as a South American leader. His victories at the battles of Pichincha and Ayacucho completed the liberation of South America from Spanish rule.

Sucre was born in Cumaná, Venezuela, and was educated in Caracas. He enlisted in the patriot army at the age of fifteen and fought under Bolívar in many campaigns. After the battle of Pichincha which finally freed Ecuador, Colombia, and Venezuela, Sucre was promoted to general and made governor of Ecuador. In 1826, he was elected first President of Bolivia, but refused to serve more than two years. He was assassinated in 1830. V.Ga.

See also BOLIVIA (Early National Period).

**SUCTION PUMP.** See AIR PUMP.

**SUDAN**, *soo D.I.V.*, is the name applied to a large area of tropical grassland in Africa extending from the At-

lantic to the Indian Ocean. The Sudan lies south of the Sahara and the Libyan Desert, and north of the tropical forests of central Africa. The climate of the Sudan is always hot and alternates between a dry winter when desert conditions extend over the region, and a wet summer when the equatorial rains prevail. The native plant life consists of luxuriant grasses three to five feet high, and scattered trees which frequently are flat-topped and thorny. Near the drier margin of the Sudan no trees will grow.

Great Britain and France control most of the Sudan although the only colony lying completely within this climatic and vegetation region is Senegal in French West Africa. France rules from Dakar to Anglo-Egyptian Sudan, where Great Britain governs the country.

The natives of the Sudan are mostly primitive farmers and herdsmen. Where European influence is strong, as



**Turbaned Natives of the Sudan** bargain in the market place of the village. Merchants sit beside their produce.

in Senegal and Anglo-Egyptian Sudan, some natives have been persuaded to plant commercial crops, such as peanuts or cotton. The natives are mostly Negroes with some Arabs, Berbers, and Ethiopians. There are few large towns in the Sudan. They include such trading centers and market towns as Timbuktu and Bamako in French Sudan, Kano in northern Nigeria, and Khartoum in Anglo-Egyptian Sudan. H.V.B.K., Jr.

See also AFRICA (color plate, Azande Girl of the Sudan); ANGLO-EGYPTIAN SUDAN; FRENCH SUDAN; RACES OF MAN (color plate, Africa).

**SUDAN GRASS** is a hay plant introduced into the United States in 1909 from Khartoum, Sudan, by the Department of Agriculture. It was first tested in Texas, and gave such excellent results that thousands of acres were planted in the South and Southwest, both in places where there was adequate rainfall and in irrigated sections. Eventually it spread to nearly all parts of the country. Sudan grass has a fibrous root system. It is an annual, which means that it is grown from seed which



must be planted every year. It looks like other tall grasses. The grass is cultivated both as stock feed and for its seed. Sudan hay has a higher feeding value than timothy. It is liked by livestock, especially hogs. It is one of the best drought-resisting plants known to American farmers, and can be grown on almost any kind of soil. Sudan grass does not do well in high altitudes. Two cuttings of hay a year can be obtained in semiarid regions, and three in places where there is adequate rainfall. The first crop matures in sixty to eighty days after being planted.

R.G.W.

**Classification.** Sudan grass is closely related to sorghum. It is classed as *Andropogon sorghum sudanensis*, in the grass family, *Gramineae*.

**SUDBURY**, Ontario (population 32,203), is the center of the great nickel industry of Canada. The city was named for Sudbury, England. It lies about 200 miles east of Sault Ste. Marie. Valuable gold and copper mines are found near Sudbury. By-products of the copper-nickel industry, such as sulfuric acid, are made in the city. Sudbury also has foundry and machine shops, sash and door factories, brick yards, and a brewery. It is the home of a modern technical and mining institute. Sudbury was founded in 1883 as a railway terminal. It received a city charter in 1930.

G.W.Br.

**SUDERMANN**, *OO der mahn*, **HERMANN** (1857-1928), was a German dramatist and novelist. His works were influenced by the plays of Henrik Ibsen and helped to make popular the new social ideas of the Naturalistic movement. Sudermann's writings emphasized the strain, nervousness, and violence of modern civilization. He believed that rigid moral rules were meaningless and that they only hampered the right of every man to be happy.

Sudermann was born at Matzicken, Prussia, and was educated at the University of Königsberg. For a short time he was a private teacher in Berlin, but later became a newspaper editor. In 1889 Sudermann's first play, *Honor*, was produced by the *Free Theater* in Berlin, and he became famous almost overnight.

B.H.C.

**His Works** include the novels *Regina* and *The Song of Songs*; and the plays *The End of Sodom* and *Magda*.

**SUDETES**, *soo DE tee*, **MOUNTAINS**. This European mountain range separates Bohemia and Lower Silesia. The center and highest part of the Sudetes is the Riesengebirge, which means *giant range*. The highest point is Schneekoppe (Snow Peak), which is 5,256 feet above sea level. These rugged and beautiful peaks are covered with pine forests. Minerals found in the mountain slopes include granite, mica, coal, and basalt. W.R.McC.

**SÜDFELD, MAX SIMON**. See NORDAU, MAX SIMON.

**SUE, EUGÈNE** (1804-1857), was a French novelist. He wrote *The Wandering Jew*, *The Mysteries of Paris*, and other supernatural and sometimes socialistic stories. He had an extraordinary imagination and was able to

create horrible and weird effects. But his plots were loosely constructed and his style was often careless. Sue was born in Paris. His father, a doctor in Napoleon's army, left him a large fortune. Sue studied medicine and was a doctor in the French Army before he settled in Paris to devote his time to writing.

L.J.

**SUEDE**, *swayd*, is a soft leather that has a nap on one side. Suede is made by holding the flesh side of the tanned animal hide against a buffing wheel, which raises the nap.

**SUET**, *SOO et*, is the hard, white, flaky fat around the loin and kidney parts of beef and mutton. Melted suet is used in making soap and candles. Beef suet is used for frying and other forms of cooking.

J.A.B.

**SUEZ**. See EGYPT (Cities).

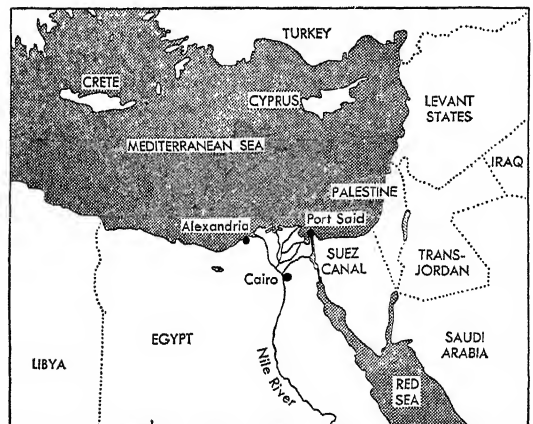
**SUEZ, soo EZ, CANAL**. This narrow, sandy waterway extends about 103 miles through desert and marshy land to join the Mediterranean and Red seas. In normal times, it is the busiest interocean canal in the world. The canal runs in a north and south direction, across the Isthmus of Suez. It starts at the extreme northwest point of the Red Sea, and ends at the town of Port Said, on the Mediterranean Sea. The Suez shortened the route between England and India by 6,000 miles. It also has restored the Mediterranean Sea to its ancient position in European and Asiatic trade.

The Suez Canal has no locks, because there is no great difference between the levels of the Red Sea and the Mediterranean Sea. At first, the canal was built to a depth of twenty-six feet, and a width of two feet at the bottom. Later, the canal was twice widened and deepened to handle larger ships and heavier traffic. Dredges operate at all times to remove the sand which is blown in from the desert. The canal was first dug out by laborers, who scooped up the dirt with their spades and threw it over the banks. After 1865, machinery was used to speed construction. In 1887, the canal was opened to night traffic, and all ships were equipped with electric searchlights. In 1886, a ship took thirty-six hours to go through the canal. Today, the trip can be made in less than eighteen hours. The cost of the canal has been figured at \$127,000,000. Although twice as long as the Panama Canal, the Suez cost only a third as much because it required less digging and no locks.



U&U

**Hermann Sudermann**, one of the first realistic German playwrights



Location Map of the Suez Canal

## SUFFOLK

**History.** Canals were built to connect the Nile River and the Red Sea hundreds of years before the time of Christ. Haroun-al-Raschid, Caliph of Baghdad, considered the idea of joining the Red Sea and the Mediterranean Sea in A.D. 700. Napoleon I saw the advantages of a waterway across the Isthmus of Suez when he visited Egypt in 1799. But it was Ferdinand de Lesseps, a French diplomat and engineer, who carried out the plan. De Lesseps got permission for the project from the Viceroy of Egypt in 1854. From 1854 to 1859, he worked to overcome various diplomatic, economical, and political problems which stood in the way of the canal building. An International Consultative Commission met in 1855 to discuss the plans and decide the route of the canal. By 1858, a company was organized with a capital stock of about \$40,000,000. Frenchmen bought over half the stock, and about one fourth was purchased by Turkey. Other countries had small shares, and the Viceroy of Egypt purchased the remaining shares. The construction of the canal was started on April 25, 1859. Ten years later, on November 9, 1869, the canal was opened to traffic.

England's large colonial possessions in Asia were brought thousands of miles closer by the building of the Suez Canal. Although England gained more from the construction of the canal than any other country, it had no part in building the canal, and bought none of the original shares of stock. In 1875, the wasteful Khedive of Egypt had forced his country into poverty, and he depended upon his shares of the Suez Canal to supply him with ready money. Disraeli, Prime Minister of England, took advantage of Egypt's poverty, and gained part of the control of the canal. The Khedive's shares were bought by the British Government, and today Great Britain holds nearly half of them. The French Government owns no shares, but it receives money through taxes levied on the company. An international committee directs the management of the canal. There are ten British, one Dutch, and twenty French members on the committee.

In 1888, an international convention agreed that the canal should be open on equal terms to ships of all nations, both in peace and in war. Great Britain refused to sign the agreement, and demanded certain privileges, because of its interests in Egypt. In 1904, however, Great Britain agreed to the original terms, which also stated that no policing or fortifying of the canal or levying tolls would be allowed by any one nation. In 1914, Great Britain disobeyed the policies of the treaty of 1888, and put armed forces on both sides of the canal. Only the ships of nations not at war were allowed to use the canal. During World War II, the canal was of vital importance, since the nation which controlled the canal and the British colony of Gibraltar could conquer the entire Mediterranean area. German and Italian campaigns in Africa tried to break British control of the canal. Today, the canal is used for its original commercial purpose, which is transporting the trade items of the East to the markets of the world.

See also LESSEPS, FERDINAND.

**SUFFOLK.** See SHEEP (Breeds of Domestic Sheep).

**SUFFRAGE.** See VOTING.

**SUFFRAGE, WOMAN.** See WOMAN SUFFRAGE.



United States Sugar Corp.

**SUGAR, SMOOG** *et.* is one of man's most important foods. It acts in the body of man much as gasoline acts in the motor of an automobile. Sugar provides heat and energy for the body, as gasoline provides power and heat for the automobile motor.

In addition to being one of our main fuel foods, sugar is one of the tastiest foods known. The people of the United States like the sweet taste of sugar so well that in normal times they eat their average weight in sugar every year. They eat about one fourth of the world's average yearly production of 60,000,000,000 pounds of sugar.

Most of the sugar that comes to our tables is made from sugar cane or sugar beets. The maple tree is another important source of sugar. Grapes, corn, wood, and certain kinds of palm trees also are sources of sugar, but none of them is nearly so important as sugar cane and sugar beets.

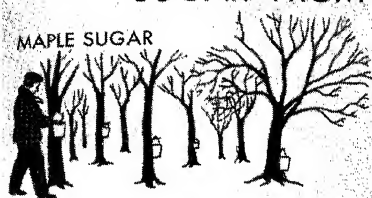
**Properties of Sugar.** Table sugar has a fuel value of 1,300 calories per pound. It is classified as a 100 per cent carbohydrate food, which means that it contains the chemical elements of carbon, hydrogen, and oxygen. The chemical formula of cane and beet sugar is  $C_{12}H_{22}O_{11}$ . Maple sugar is made up of eighty-three parts of carbohydrates, sixteen parts of water, and one part of other minerals.

**Cane Sugar.** Most of the world's supply of cane sugar comes from the huge sugar-cane plantations of Cuba and India. Puerto Rico, the Virgin Islands, and Louisiana also produce large amounts of sugar. In normal times, the plantations of India produce more than thirteen billion pounds of cane sugar a year. Cuba produces more than seven billion pounds each year.

Sugar cane grows best in the warm, sunny countries of the world. The farmers plant pieces of cane in trenches and cover them over with dirt. Soon, the green

# SUGAR—FROM A TREE, A ROOT, AND A GRASS

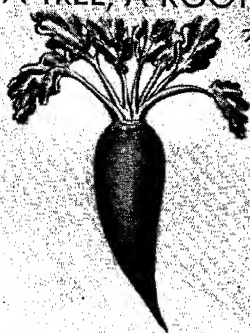
## MAPLE SUGAR



Sap from maple trees was made into sugar in colonial days.



Sap is collected in buckets or pans. Sugar and sirup are made from it by boiling sap.



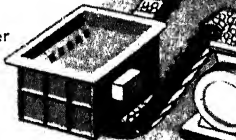
## BET SUGAR



Machines unload truckload of beets. They remove dirt in less than two minutes.

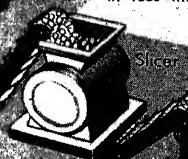
## Washer

Beets are given thorough washing



## Slicer

Slicer cuts beets into thin strips. Sugary juice is soaked out in hot water.



## Diffusion Tank

## Gas Purifying

## Lime Gas Kiln

Juices are purified by gas treatment.

## Filter

## Vacuum Pans

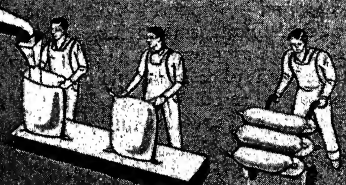
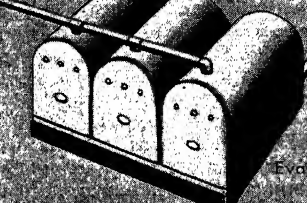
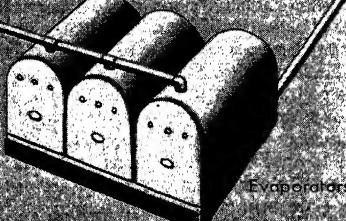
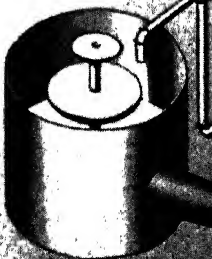
## Evaporators

Purified and filtered juice is boiled down to a heavy sirup in evaporators. Sirup flows into vacuum pans and is turned into crystals.

## Drier

## Centrifugal Separator

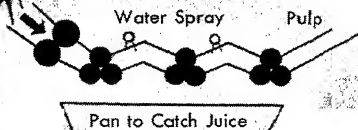
Centrifugal machine whips crystals and sirup against screen at high speed to separate them. Following separation, crystals are dried in warm air. Sugar is then ready for packaging.



## CANE SUGAR

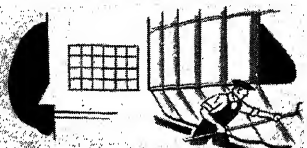
### Water Spray

### Pulp



### Pan to Catch Juice

Sugar cane is crushed in rollers to separate juice from pulp.

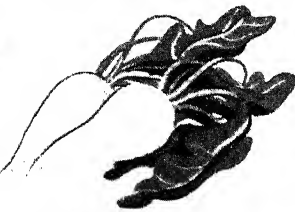


Juice is purified and refined in factories in way similar to sugar-beet process.

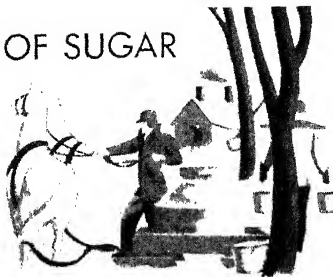
## MAIN SOURCES OF SUGAR



Sugar Cane



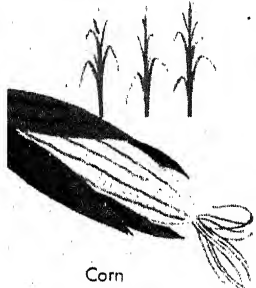
Sugar Beet



Maple



Grape



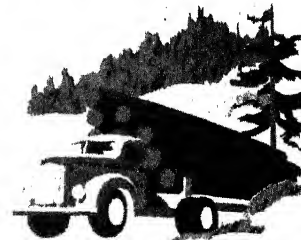
Corn



Date Palm



Nipa Palm



Wood

plant pushes its way up through the loose earth. The plant grows taller and taller. Within a year it reaches a height of from six to fifteen feet and measures from one to two inches through. A field of sugar cane looks almost the same as a field of corn before the cornstalks form ears.

The sugar cane is heaviest with sugar juice just before its flowering time. The farmers cut it off close to the ground, leaving the stubble to grow the next year's crop. The tops of the cane stalks are cut off immediately after it is cut, and the leaves are stripped off. The cane is now loaded onto railroad cars and sent as quickly as possible to the sugar refinery. The stalks dry out rapidly if they are left in the fields after they are cut. As soon as the sugar reaches the refinery, the stalks are washed and cut into short pieces. Then they are run through a huge machine with heavy rollers from eighteen to seventy-two inches long. The rollers smash the short lengths of cane, and squeeze out their juice. Sometimes, two or three sets of rollers are used, with each set heavier than the set before. In this way practically all (90 to 95 per cent) of the juice in the cane is squeezed out. Water is sprayed onto the sugar-cane stalks as they pass from one set of rollers to another. The water helps wash out all the sugar from the cane. After all the juice is taken out of the cane, the crushed stalks—called *bagasse*—are burned as fuel in furnaces. The furnaces, in turn, produce the steam which operates the huge rollers.

The cane juice must be purified before the first sugars are separated from the liquid. Most sugar refiners do this by placing the juice in large kettles. They add lime-water to remove various acid impurities and to keep the juice from separating into fruit sugars, or *levulose*, and grape sugars, or *glucose*. The mixture of cane juice and limewater is heated to speed up the reaction between the limewater and the impurities. Then the impurities are strained out. Finally, carbon dioxide is added to the mixture to remove any limewater left in the juice.

The purified cane juice is poured into big pans, called *evaporators*. It is heated until the liquid juice forms steam and boils off, or evaporates, leaving a heavy

sirup. The sirup is then boiled in pans which have little air in them. The sirup boils at a much lower temperature in these *vacuum* pans than it would in open pans. This means that it is not necessary to use such a high temperature that the sugar in the sirup is ruined by being burned. The sirup in the vacuum pans slowly changes to lumps, or *crystals*, of sugar, and a very thick sirup, called *massecuite*. The *massecuite* and sugar crystals are placed in a mixing machine and stirred very quickly. Then, the mixture is fed into cylinders which turn very fast. These cylinders are called *centrifugals*. As the *centrifugals* turn, the light sugar crystals are thrown toward the center of the cylinders, and the heavier liquid of the *massecuite* is thrown outward and forced through copper gauze screens placed at the sides of the centrifugal cylinders.

The liquid *massecuite* is later boiled and reboiled to make molasses. The sugar crystals that remain are further purified and refined before they are sold as table sugar. All color is removed from the sugar by straining the crystals through a substance called *boneblack*. Then the sugar is made into fine grains, or granulated sugar. This is done in a swiftly turning cylinder heated by steam.

Cube, or loaf, sugar is made by packing the granulated sugar in rather large molds. The molds can then be divided into loaves of the desired size and shape. *Coffee* sugar and *broken* sugar are made from the sirup, or *massecuite*, that is separated from the first sugars to be refined.

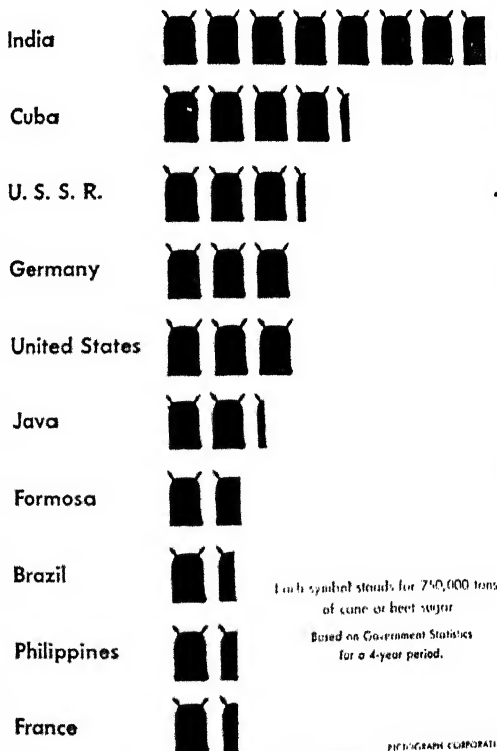
Many changes have been made in sugar-refining processes, since the first refinery was set up at New Orleans, La., by Antonio Mendez, in 1791. A recent development in sugar refining is a method for separating the first sugars at the same time that the cane juice is purified. It is called *magnetic filtration*. Magnetic filtration works by using plastics, which attract the impurities in the cane juice, as the filtering agents. The plastic filters are put inside the evaporators. As the cane juice is heated to form the heavy sirup from which the first sugars are separated, the impurities leave the sugar to gather on the plastic filters.

**Beet Sugar.** Sugar was first taken from beets by a German scientist, Andreas Marggraf, in 1747. But the beet sugar industry did not develop until the 1800's. Today, beets rank next to cane as a source of sugar. Sugar beets are grown on huge plantations in Russia, Germany, the United States, and Poland. They yield one third of the world's sugar production.

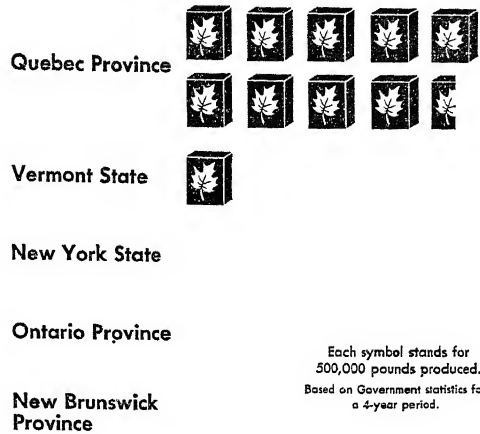
Beets are a root plant and must be pulled from the ground at harvest time. The tops are removed in the field or when the beets reach the refinery. Then the beets are washed and put into slicing machines. These machines have three-cornered knives which cut the beets into slices very much like shoestring potatoes. The slices drop through a chute into a large machine that is made up of a series of tall tubes or cylinders. This machine is called the *diffusion battery*, and its cylinders are called *cells*. Each cell holds about two to six tons of beets. Warm water is run into the battery, where it passes from one cell to another throughout the whole chain of cells. As the water passes through, it draws the sugar from the beets. The mixed sugar and water are called *diffusion juice*. Diffusion juice is made up of from twelve to fifteen parts sugar to eighty-five to eighty-eight parts water. When all the sugar has been removed from the beets, the beet pulp that is left is used for stock feed. The diffusion juice is purified and evaporated to make beet sugar. When beet sugar is highly refined, it cannot be distinguished from cane sugar.

**Corn Sugar** is made from corn starch. The starch is treated with hydrochloric acid and heated by steam.

### Ten Leading Sugar Countries



### North American Maple Sugar Regions



This changes the starch to sugar. Corn sugar is not as sweet as cane sugar. It is used mostly in candy and in the manufacture of alcohol. Corn sugar is known by the scientific names of *glucose* and *dextrose*. It is one of the most easily digested kinds of sugar, since the digestive juices change all kinds of sugar into glucose before it is absorbed into the body.

**Sugar from Wood.** The Germans developed a process for making sugar from wood in 1926. The fibers, or cellulose, of wood have a chemical make-up that is very much like the make-up of starch, except that the molecules which make up cellulose are larger and heavier than the molecules of starch. To make sugar from wood, the wood must first be ground into sawdust. Then the sawdust is treated with a solution of 40 per cent hydrochloric acid. Water is added in the proportion of one molecule of water for every molecule of wood cellulose. This converts the wood cellulose to sugar. Sugar from wood is very much like corn sugar. It is not very sweet, but it is extremely nutritious. G.L.Bv.

**Related Subjects.** The reader is also referred to:

Candy	Glucose	Saccharin
Carbohydrate	Honey	Sugar Beet
Cellulose	Maple Sugar	Sugar Cane
Dextrose	Molasses	

### Questions

About how much sugar does the average person in the United States eat in a normal year? How much of the world's supply of sugar do Americans eat? Why is sugar an important food?

From what besides cane is sugar made?

What countries lead the world in the production of cane sugar?

In what kind of land does sugar cane grow best? How is it planted?

When and how is sugar cane harvested?

How is loaf sugar made? What is brown sugar made from?

When and by whom was the first sugar refinery in the United States set up? Where was it built?

Who first removed sugar from sugar beets? When was this?



What countries lead in the production of beet sugar?

How does corn sugar differ from cane sugar? Why is it easily digested?

When was a process developed for making sugar from wood? How is this done?

**SUGAR BEET.** The sugar beet is grown for the sugar that is obtained from its root. It is a *biennial* plant, because it takes two years for the plant to fully mature. During the first year, the plant grows a large fleshy root, a fleshy stem, and a cluster of leaves. The fleshy root is what is commonly known as the *beet*. But the beet is not the entire root. The rest of the root tapers down from the beet. It is long and slender with many thread-like branches. This root grows straight into the ground as far down as four to six feet. The top of the beet is known as the *crown*. The crown is very short. It sends out bunches of leaves much like those on ordinary table beets. At the end of the first year of growth, the sugar beet is usually dug up and sent to the sugar refinery. If it is left in the ground for the second year, the plant sends out long branches that produce tiny flowers con-



The Tops of the Sugar Beets are cut off with a heavy, sharp knife before the beets are hauled from farm to market.

taining seeds. These flowers may be either reddish or greenish. The sugar beet may be as high as four feet when it is in full bloom.

The fleshy root of the sugar beet is second only to the sugar cane among important sources of sugar. The beet is usually white or cream colored and quite large. It may weigh several pounds. The beet contains more than

10 per cent of sugar. It is made up of small cells and large cells. The small cells contain the sugar and the large cells store water. These cells are arranged in rings called *cambium* rings. The rings can be seen when the beet is cut crosswise.

Sugar is taken from the beets by washing the beets and cutting them into thin slices. These slices are put into hot water, which removes the sugar from the beets.

### Ten Leading Beet-Sugar Countries

U. S. S. R.



Germany



United States



France



Czechoslovakia



Great Britain



Poland



Italy



Sweden



Belgium



Each symbol stands for 300,000 tons.

Based on Government Statistics for a 4-year period.

PHOTOGRAPH CORPORATION

By a series of chemical processes, more of the sugar is removed and the sugar is bleached and purified for final use.

Almost every part of the sugar-beet plant is put to good use. The leaves of the plant are cooked as greens. The crown, or stem, is used as food for cattle, sheep, hogs, and other animals. The pulp of the beet that remains after the sugar is extracted also is used as feed for animals.

The sugar beet was first discovered as a source of sugar about 1800 in France and Germany. About a hundred years later, the plant was brought to the United States and is grown in Wisconsin, Michigan, Colorado, and California. It was not until after World War I, however, that sugar beets became an important source of sugar in the United States and Canada. Their use greatly increased during World War II. L.A.S.

See also BEET.

**Classification.** The sugar beet belongs to the family *Chenopodiaceae*. The species is *Beta vulgaris*.

**SUGARBERRY** is a common name for the nettle tree of North America, which greatly resembles the elm.

**SUGAR CANE** is a very tall grass plant which grows in tropical and semitropical countries. It produces sturdy stalks ten to fifteen feet high, and about two inches in diameter. These stalks contain a large amount of sugary juice from which sugar and sirup are made.

Sugar cane grows from a thick, solid rootstock. The numerous stalks have no branches, but have long, narrow leaves which are arranged in two rows. The stalk is divided into several sections, like a bamboo cane. These sections are called *internodes*. Each node bears a small bud which looks much like a potato eye. The color of the stem varies from yellow to reddish. Some of the stems have green or white stripes.

Sugar cane blossoms only in tropical countries, but even there some varieties never produce flowers. The chief sugar-cane regions in the world are Cuba, India, Java, Puerto Rico, the Hawaiian Islands, and the Philippines. About three fourths of the cane sugar grown

sula yield excellent crops, but drainage is very important there. The soils of the Hawaiian Islands are rich in lime, potash, phosphoric acid, and nitrogen. The Hawaiian plantations yield the richest crops of sugar cane in the world.

Sugar cane is grown chiefly from stem cuttings. The seed is used principally for cross-fertilization and to produce new varieties. Many varieties do not even bear fertile seeds.

## Ten Leading Cane Sugar Countries

India

Cuba

Java

Taiwan

Brazil

Philippines

Puerto Rico

Hawaii



Each symbol stands for 500,000 tons.  
Based on Government Statistics for a 4-year period.

Australia

China

PICTOGRAPH CORPORATION



United States Sugar Corp.

### Brushlike Flowers Top the Tall, Swaying Sugar Cane

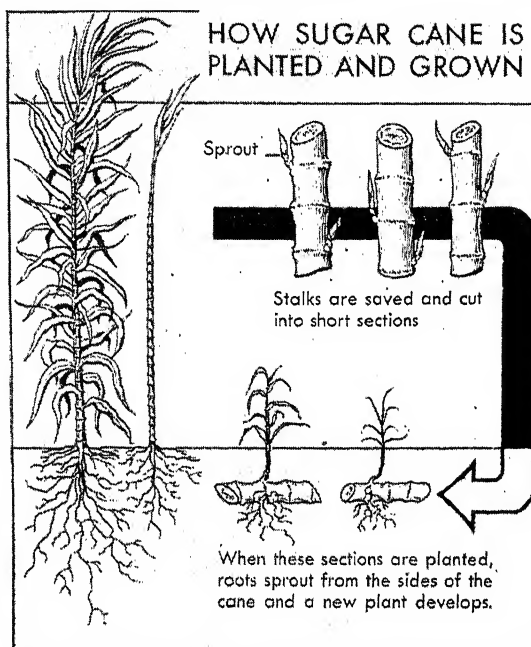
in the United States comes from Louisiana. Small quantities also are produced in Alabama, Mississippi, Florida, and Texas. The American people use so much sugar that nearly all the United States supply must be imported.

**Growth and Cultivation.** The best soil for sugar cane is a fertile soil which can hold a large amount of moisture. The plant needs much water; irrigation is necessary if there is not much rain in the region. A heavy subsoil of clay helps keep the plant food from leaching away, especially when a large amount of irrigation is used. The soils of Louisiana and of the Florida penin-

Great furrows from five to seven feet apart are dug in the field. The cuttings are laid horizontally in the furrows. Some planters use only the upper part of the cane for planting. Others use the entire cane, and some planters plant only the matured part.

After the cuttings have been planted, soil is thrown over the furrows, until the cane is covered. In a short time the buds borne on the nodes swell and burst, and young stalks of cane emerge from the soil. Soon the leaves appear, and in a few weeks the stalks have developed nodes and internodes. Cultivation should begin as soon as the cane has a good start, for the field must be kept free from weeds and grass. The surface soil is cultivated often, and two or three hoeings are also helpful. Under favorable conditions the cane grows rapidly.

Hand cutting is still used more than machine cutting for sugar cane. Each cutter is given a large steel knife which has a blade five inches wide and eighteen inches long, with a hook on the back. As the cutters move down the rows, they cut the cane close to the ground, strip off the leaves with the hook, and cut off the top of the stalk at the last matured joint. The cut stalks are thrown into heaps called *windrows*, and then



gathered up into carts or narrow-gauge railway cars to be carried to the sugar factory. The stubble left in the field produces a second or third crop in Louisiana, and five or ten crops in the tropics. But usually the field is planted again every year or two, for the yield is not usually profitable otherwise. F.Tu.

See also SUGAR (Cane Sugar).

**Classification.** Sugar cane is *Saccharum officinarum* in the family Gramineae.

**SUGAR LOAF.** See RIO DE JANEIRO.

**SUGAR MAPLE.** See MAPLE.

**SUGAR OF LEAD.** See ACETIC ACID; LEAD.

**SUGAR OF MILK, or LACTOSE.** See CARBOHYDRATE.

**SUGAR STATE.** See LOUISIANA.

**SUGGESTION, sug JES chun.** Anyone who wants to gather a crowd can do so by standing on a busy corner and gazing intently at the roof of a distant building. Others also will stop to stare. If someone asks what the crowd is looking at, our experimenter need only say, "We think that building is on fire." Someone will almost certainly exclaim that he sees a wisp of smoke or a flash of flame. This experiment is not recommended, for fear some conscientious citizen may turn in a fire alarm. But it is an example of how suggestion works.

The mind tends to complete any partial picture. If someone makes a motion of throwing, many observers will feel sure they have seen an object leave his hand. If a child says "I don't feel well," his mother may touch his forehead and assure herself that he has a fever, even though a thermometer may show his temperature to be quite normal.

**Uses of Suggestion.** A professional magician relies on suggestion for most of his effects. If he goes through the motions of tossing a coin into a cup, and if the audience hears the expected jingling sound, the audience takes for granted that the coin is in the cup.

Advertisers use suggestion in many ways. No one

dares to guarantee that a girl will become popular by using a particular brand of soap or toothpaste, but slogans, pictures, or even comic strips may strongly suggest such a result.

**Causes of Suggestibility.** Children are more suggestible than adults. This is because they are less critical and less experienced. The ignorant and uneducated are more suggestible than the educated. Prejudice and wishful thinking increase suggestibility. People resist suggestion poorly when they are tired, worried, or ill.

**Autosuggestion.** Sometimes a person will suggest something to himself so strongly that he becomes certain of its truth. He may do this on purpose, and thus overcome fear or worry. But more often autosuggestion leads persons to frighten themselves. Some can read the symptoms of a disease and quickly discover one or several such symptoms in themselves. Autosuggestion is more often an enemy than a friend to mankind because it so frequently leads to distress or worry. R.H.WHE.

See also CONJURING; HYPNOTISM; MAGIC.

**SUICIDE.** A person who deliberately kills himself commits suicide. Many authorities think that suicide becomes more common as life grows more complex. It is rare among primitive peoples. City dwellers are far more likely to commit suicide than rural people. Laborers are much less likely to commit suicide than business and professional men.

Throughout the world, three or four times as many men as women kill themselves. Male suicides generally hang themselves, or use a knife or a gun. Women often choose drowning or poison as the means of death. Women who commit suicide usually do so much younger than men. Both men and women are less likely to kill themselves if they are married.

Year after year, the number of suicides has always increased during the late spring and early summer. The rate of suicide is highest in the age group between fifty-five and sixty-five. Eire has the lowest suicide rate of any country. The highest rate is found in the German province of Saxony.

Different groups have held widely different attitudes toward suicide. Many ancient peoples held that a person's life was his own, to keep or give up as he pleased. Christianity has always considered suicide a sin, and many Christians have believed that the person who committed suicide gave up his hope of getting to heaven. Many churches still hold this view. Roman Catholics are less likely to commit suicide than Protestants. Jews have a still lower suicide rate.

Suicide is against the law, but the would-be suicide knows that he will be beyond the reach of the law if he succeeds in killing himself. Attempted suicide is sometimes punished by law. W.D.H.

**SUIT, saot.** When a person seeks the help of a court of law to enforce his rights, he is said to "bring suit." Someone who has suffered injury at the hands of another may bring suit for damages. A person also may bring suit to recover property, to collect money owed to him, to enforce the terms of a contract, or to accomplish one of many other purposes. A city, state, or other governmental unit may bring suit in the same way as a private person or a corporation.

In general, a suit is any civil action brought before

a court of law. Criminal prosecutions are not spoken of as suits. See also COURT (Judicial Procedure). H.CAL.

**SUITE**, *sweet*. There are two kinds of *suites*, the classic and the modern. The classic suite is a collection of dances grouped together for their contrasting style and rhythms. One dance may be slow and the next fast, one stately, and another gay, but they are all played in the same key. The classic suite was most popular in the 1600's and 1700's, and influenced the development of the *sonata*. The modern suite is merely a sequence of contrasting sections, usually connected by some idea or story, as for example, the *Nutcracker Suite* of Tchaikovsky or the *Second Daphnis and Chloe Suite* of Ravel. See also SONATA. R.KEN.

**SUKKOTH**. See TABERNACLES, FEAST OF.

**SULEIMAN I**, *soo lay MAHN* (1496?-1566), known as The Magnificent, was a sultan of Turkey. He was a great conqueror and under him his country reached the height of its power. The Turks regarded him as a lawgiver, for he greatly improved the legal system of Turkey.

Suleiman was the son of Selim I, and followed his father to the throne in 1520. The country was prosperous, and Suleiman devoted himself to fighting the Christian powers. He captured Belgrade and pressed on into Hungary. In 1526 he won a great victory at Mohács, and went on to threaten Vienna. Suleiman was finally forced to retreat from Vienna, but he never gave up his hold on Hungary. He took Rhodes from the Knights of Malta, and conquered part of Persia (now Iran). Later he became an ally of Francis I of France and began to take part in European political affairs. His last years were spent in wars with Persia, the Knights of Malta, and Spain. E.McI.

**SULFA DRUGS**, also called *sulfonamides*, are a family

of chemicals that fight bacteria in the body. The discovery of sulfonamides was a great advance in the treatment of infection. They came into general use in 1936. The sulfa drugs are made from substances obtained from coal tar. They all contain sulfur, nitrogen, hydrogen, and oxygen, held together in an arrangement called the *sulfonamide group* ( $\text{SO}_2\text{NH}_2$ ).

The most important members of the sulfa family are sulfanilamide, sulfapyrazine, sulfamerazine, succinyl-sulfathiazole, sulfathiazole, sulfadiazine, and sulfaguanidine. Prontosil is a red dye which releases sulfanilamide in the body. According to their individual actions in the body they are used for pneumonia, dysentery, meningitis, streptococcal and staphylococcal infections that cause much blood poisoning; osteomyelitis, a bone infection; and gonorrhea, a venereal disease.

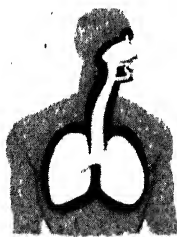
**Uses in Treating Diseases.** The sulfa drugs are usually taken by mouth in tablets. Proper treatment calls for large amounts, for the drug passes fairly rapidly from the body, and because adequate concentrations must be built up in the body tissues. An amount equal in size to three aspirin tablets is usually taken every four hours for five to ten days. It is not safe to take sulfa drugs without a doctor's direction, for such large doses can have bad effects on the body. Furthermore, improper dosage may cause the bacteria to become resistant to the action of the drug. Soluble forms of the drugs are injected directly into the blood. This is necessary when the patient can take nothing by mouth, or when he or she is desperately ill and is in need of fast action. The drugs can be prepared in crystals or powder and sprinkled over open wounds. Sulfa salves, sprays, and films also have been used.

The sulfa drugs have been successful against some of

## DISEASES TREATED BY SULFA DRUGS



Wounds



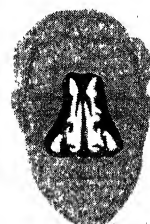
Pneumonia



Meningitis



Mastoid Infection



Sinus Infection



Middle Ear Infection



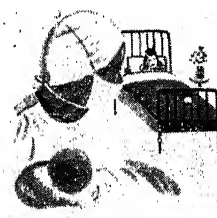
Venereal Diseases



Skin Infections



Boils



Childbed Fever

the most dangerous types of infection. They check many septic wounds, puerperal fever, erysipelas, cellulitis, and venereal infection. Cures also have been reported for many other infections. The drugs have cut down the death rate from disease, but penicillin is better for treating some infections. Before sulfanilamide was used, 85 to 90 per cent of patients with blood poisoning died. The sulfa drugs cut the average to between 65 to 70 per cent. Penicillin has cut it still further. The skin infection in erysipelas stops spreading within 24 hours when treated with sulfa. Before the sulfa drugs, this disease was highly fatal among children. Very rapid treatment of gonorrhea, lasting only four or five days, has been very successful. Sulfaguanidine is widely used for dysentery infections of the intestine.

Doctors are not sure just how the sulfa drugs act. They probably interfere with some complicated enzyme systems necessary for the survival of bacteria. They are strongest while the bacteria are rapidly increasing (an acute infection), but weaker against a chronic infection.

**Precautions.** Large doses of sulfa drugs may give a person a gray color, due to changes in the blood. This is not dangerous when the person is under a competent doctor's care. But sometimes the drugs act as poisons, and can lead to death in a few days. The danger of poisoning is not great. It is much smaller than the dangers from the severe infectious diseases. Doctors can test a person's blood to see whether the drugs may be dangerous.

A person who uses these drugs carelessly, whether they are needed or not, may become sensitive to their harmful effects. Then he will not be able to use them later when they might save his life.

**Development of the Sulfa Drugs.** Sulfanilamide was first produced in 1908 by Paul Gelmo, a German chemist. For years chemists were interested chiefly in its compounds, the *azo* dyes. In 1935 the German bacteriologist, Gerhard Domagk, showed that one of these dyes, *prontosil*, killed streptococcus infection in mice. He was offered the Nobel Prize of 1939 for his work but could not accept it under the Nazi regime. Several French and English scientists soon showed that *prontosil* in the body broke down into sulfanilamide, the real germ killer. Most of the other sulfa drugs were discovered by chemists in the United States.

The sulfa drugs proved their worth in World War II. During World War I, more than 80 per cent of the deaths from wounds were caused by infection. Battle kits in World War II contained sulfanilamide powder and sulfadiazine tablets. Wounded soldiers often swallowed the tablets and dusted their own wounds with sulfa powder while waiting for medical corpsmen to arrive. In June, 1940, the British War Office reported that wounds treated with sulfa drugs were in much better condition than similar wounds in World War I. The drugs helped military surgeons save many lives that would have been lost otherwise.

The American chemical industry increased the supply of sulfa drugs from 737,903 pounds in 1940 to 8,200,000 pounds in 1943.

A.E.S.

**SULFATE** is a salt of sulfuric acid. As a rule sulfates are stable compounds, formed in crystals. Most of them

are fairly soluble in water. But such sulfates as barium, strontium, and lead sulfates, can not be dissolved in water. Sulfates are very important. Heavy spar is a sulfate of barium; gypsum is a sulfate of calcium; celestite is a sulfate of strontium; and Epsom salt is a sulfate of magnesium. Copper sulfate, or blue vitriol, is used in many industries, including dyeing and calico printing. Iron sulfate is used in making ink and as a medicine. Manganese sulfate is used in calico printing. Zinc sulfate is used in surgery as antiseptic, in calico printing, and in drying oils for varnishes. A double sulfate of potassium and aluminum, known as *alum*, is used in some baking powders. Every sulfate contains a group of associated atoms of sulfur and oxygen known in chemistry as the *sulfate radical* ( $-\text{SO}_4$ ). See also *ALUM*; *BLUE VITRIOL*; *GYPSUM*.

G.L.Bu.

**SULFIDE.** The sulfides are compounds of sulfur with some other elements, usually a metal. All sulfides contain the sulfide ion, in which sulfur has the valance of minus 2. The chemical symbol for this ion is  $\text{S}^{--}$ .

Sulfides are important in chemistry and industry. Hydrogen sulfide, a poisonous gas, is used in the laboratory to test for different metals. Hydrogen sulfide in the air tarnishes silver. Carbon disulfide is a solvent of rubber and sulfur, and a local anesthetic. It has been used to kill animal and insect pests. Deposits of metallic sulfides are important ores of the metals. Examples are the sulfides of zinc (zinc blende), lead (galena), mercury (cinnabar), and copper (chalcocite). Several colored sulfides are pigments in paints.

G.L.Bu.

See also *CARBON DISULFIDE*; *HYDROGEN SULFIDE*.

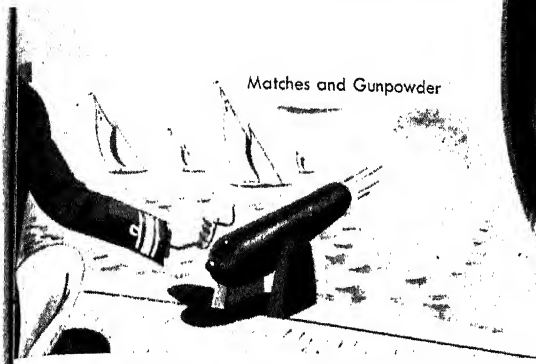
**SULFUR** (chemical symbol, S) is a solid, nonmetallic element which is found in great quantities in nature. Sulfur has an atomic number of 16 and an atomic weight of 32.06. It is found in many vegetables, such as onions, cabbage, and horseradish. It is necessary for the growth of plants and animals. Sulfur also is found in eggs. A sulfur compound makes the strong odor noticeable when the eggs become rotten. In the mineral world, sulfur is found both in a pure state and combined with other substances. Sulfur is found in the pure state in places where there are volcanoes. It is combined with other metals to form certain valuable metal ores such as *sphalerite*, *galena*, *cinnabar*, and *stibnite*. *Gypsum*, or *calcium sulfate*, is an important mineral which contains sulfur.

Sulfur comes in three forms, known as *allotropic* forms. Allotropic forms of an element are different in their physical forms, but have the same chemical properties and are in the same state of matter. Sulfur comes in rhombic crystals, monoclinic crystals, and amorphous, or plastic, form. The *rhombic* crystals have three unequal axes, each of which is at right angles to the other. *Monoclinic* crystals are very transparent and are shaped like prisms. That is, two of the axes are at right angles with the third axis. *Amorphous*, or *plastic*, sulfur which may be formed by dropping molten sulfur into cold water, readily changes to the crystalline, rhombic form. Ordinary lump sulfur is found in either rhombic or monoclinic crystals. It is pale yellow in color, though sulfur may sometimes be greenish, brownish, or reddish. Sulfur is brittle and has almost no taste. It gives off a peculiar odor when it is rubbed or melted, which can



## A FEW COMMON COMMERCIAL USES OF SULFUR

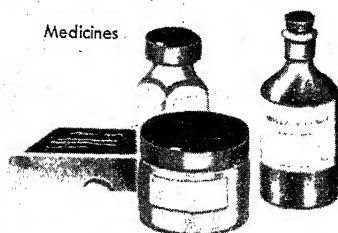
**Commercial Use of Sulfur** is among the widest of any of the elements. Sulfur is an important part of thousands of products and manufacturing operations.



Matches and Gunpowder

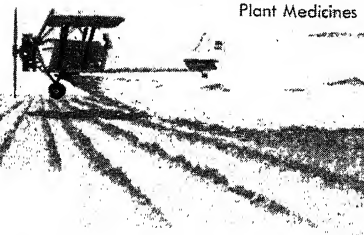


Rubber



Medicines

Insecticides and Plant Medicines



best be described as a "rotten egg" odor. Sulfur is a poor conductor of heat and electricity. It does not dissolve in water but will dissolve slightly in alcohol or ether. It dissolves readily in carbon disulfide.

Sulfur melts into a yellow liquid at a temperature of  $230^{\circ}$  Fahrenheit. If it is heated above this temperature, the liquid becomes sirupy or turns into a solid. When the temperature reaches about  $482^{\circ}$  F., the sulfur becomes so thick that it cannot be poured from the vessel. Above  $482^{\circ}$  F., the sulfur changes back into a liquid. The boiling point of sulfur is  $832^{\circ}$  F. When it boils it gives off a yellowish-brown vapor. This vapor is condensed, or *sublimed*, into fine, yellow grains of powder known as *flowers of sulfur*. The roll sulfur that is used commercially is made by pouring liquid sulfur into molds shaped like cylinders. The liquid hardens in the molds and is cast into shape.

Sulfur burns very quickly at a low temperature. It burns with a pale-blue flame and gives off *sulfur dioxide*, which is a colorless gas. When sulfur is exposed to moist air, it mixes with the oxygen and water in the air and forms *sulfuric acid*. Both sulfur dioxide and sulfuric acid are constantly being formed in the air in large cities, where a large amount of coal and gas is burned.

Before 1900 almost all of the pure sulfur in the world was produced by Sicily. Today the United States is one of the chief sources of sulfur. Texas and Louisiana are the leading states in sulfur production. Sulfur also is found in Spain, Mexico, Iceland, and Italy.

The most common method of mining sulfur is called the *superheated water method*. This method was invented about 1900 by the American scientist Herman Frasch. By this method, sulfur deposits are heated beyond the melting point, known as *superheating*. Hot water (superheated under increased pressure so that its boiling point is above  $230^{\circ}$  F.) is sent down to the sulfur deposits by means of a hollow pipe, which is about six inches in diameter. This pipe is placed inside a larger pipe. As the sulfur is melted, it is forced up through the larger pipe in the form of a foam. The forcing is done by use of compressed air in a third pipe, the smallest of the three. All other substances that require a higher melting point remain. By this method, the sulfur is purified as well as mined.

Sulfur has many commercial uses. Pure sulfur is used to make up a group of valuable substances known as *sulfur compounds*. These sulfur compounds include sulfuric acid, the sulfite salts, and sulfur dioxide. Sulfur is mixed with saltpeter and charcoal to form gunpowder and is used to some extent in the manufacture of matches. For the farm, sulfur is used in the manufacture of fertilizers, and in preparations that destroy insects and plant pests. The lime-sulfur spray is especially used as an insecticide. Sulfur also has an important use in the making of paper pulp, which is produced by the action of calcium bisulfite on wood cellulose. Sulfur is used in various medicines and is considered helpful in certain skin diseases. In the field of photography, a sulfur compound, *sodium thiosulfate*, is used in fixing photographic images after development. There are many other ways in which sulfur plays an important part in our daily lives.

G.L.Bu.

See also SULFA DRUGS; SULFATE; SULFIDE; SULFUR DIOXIDE; SULFURIC ACID.

**SULFUR**, or **SULPHUR**, **BUTTERFLY**. See BUTTERFLY (Kinds of Butterflies); INSECT (color plate, Butterflies [Eurytheme Sulfur]).

**SULFUR-BOTTOM**. See WHALE (Kinds of Whales).

**SULFUR DIOXIDE**, *dye AHK side* (chemical formula,  $\text{SO}_2$ ), is a colorless gas with a sharp odor of burning sulfur. It is a compound of sulfur and oxygen, and is found in gases from volcanoes and certain mineral waters. Sulfur dioxide is manufactured by burning sulfur or roasting sulfides.

Sulfur dioxide is about twice as heavy as air. It is easily changed to a liquid below  $-10^{\circ}$  centigrade or under pressure. The substance is shipped as a liquid in small tanks which give off the gas when they are opened.

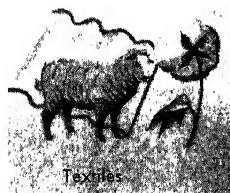
Sulfur dioxide is extremely soluble in water. It also combines with water to form *sulfurous acid*, used as an antiseptic, preservative, and bleach. Fumes of sulfur dioxide are used to keep drying fruits from fermenting and to preserve foods for canning.

Sulfur dioxide also is useful in small refrigerating systems. The liquid takes up much heat when it changes back to gas. Its most important use is in preparing *sulfur trioxide*, which is used to make sulfuric acid.

G.L.Bu.

**SULFURETED HYDROGEN**. See HYDROGEN SULFIDE.

## SOME USES OF SULFURIC ACID



Textiles



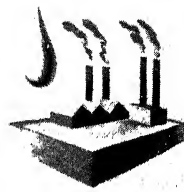
Paints and Pigments



Explosives



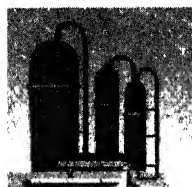
Coal Products



Chemicals



Fertilizer



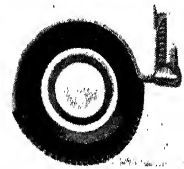
Petroleum Refining



Metallurgy



Rayon and Cellulose



Synthetic Rubber

**SULFURIC ACID**, or **OIL OF VITRIOL** (chemical formula,  $\text{H}_2\text{SO}_4$ ), is the most useful acid in industry. An old alchemical name is *oil of vitriol*. Its yearly production in the United States is measured in millions of tons. There is hardly a manufactured article in common use today which does not depend upon sulfuric acid either directly or indirectly. In war or peace, this acid is the heavy chemical that keeps our industrial processes moving. In normal times, its largest use is in the manufacture of fertilizers. A close second is its use in refining petroleum, especially the purification of gasoline. Sulfuric acid takes part in the manufacture of all other mineral or inorganic acids as well as in making hundreds of other valuable chemicals. Large quantities of sulfuric acid are necessary in the steel industry, in production of other metals, and in electro-plating. Along with nitric acid, it is indispensable in producing TNT, nitroglycerine, picric acid, and other explosives.

Two important processes, the contact process and the lead-chamber process, are in common use for the manufacture of sulfuric acid. In each process, sulfur dioxide is obtained either by burning sulfur or by roasting metallic sulfides, which are sulfur compounds. In the *contact process*, sulfur dioxide is changed to sulfur trioxide by mixing with air. The heated mixture is passed through a tube containing platinum or vanadium oxide as a catalyst. Sulfur trioxide is then dissolved in water to form sulfuric acid. The major difference between the contact process and the older *lead-chamber process* is the use of nitric acid ( $\text{NO}$ ), and nitrogen dioxide ( $\text{NO}_2$ ) as catalysts or carriers of oxygen in the lead-chamber process. It is most economical to prepare concentrated and pure sulfuric acid by the contact process. G.I., Bu.

See also ACID; BLEACHING; SULFATE.

**SULFUR POLYPOR**, *PAHL ih pohr*. See MUSHROOM (color plate, Shelflike Brackets Grow on Trees).

**SULGRAVE MANOR** is an estate in Northamptonshire, England, which is regarded as the home of George Washington's ancestors. The Washington family owned it from 1539 to 1610, when it was sold by Robert Washington and his son Lawrence. The manor house was built by Lawrence Washington in the 1500's. The British Government bought the house in 1914 to celebrate the hundred years of peace between Britain and the

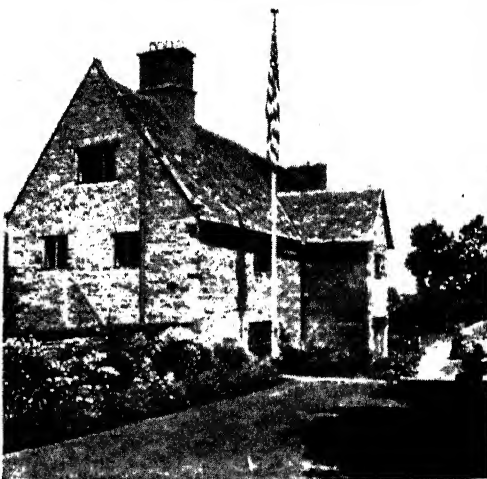
United States. The house is still fairly well preserved. American patriotic societies helped to furnish and restore the interior.

T.F.H.

**SULLA, LUCIUS CORNELIUS** (138-78 B.C.), was a Roman general and statesman who was known as Felix, or "The Fortunate." Sulla was born into a noble family and received an excellent education. He entered the army and fought in Marius' campaigns against Jugurtha in Africa. Sulla soon proved his military worth and fought again in the wars against the Teutons and Cimbri, which brought Marius to the height of his power.

In 93 B.C. Sulla was made praetor, and the next year was appointed governor of Cilicia. On his return to Rome in 91 B.C. he fought in the Social War and gained such fame that Marius became jealous of him. Sulla was made consul in 88 B.C. and led the war against Mithridates. Marius wanted command in this campaign and started a revolt which forced Sulla to flee to his troops in Campania.

But Sulla returned to Rome at the head of his legions



Gendreau

**Sulgrave Manor**, in Northamptonshire, England, was the comfortable home of George Washington's ancestors.

and drove out Marius. Marius died while Sulla was engaged in the war, and when Sulla returned he was the most powerful man in Rome. He wiped out the Marian party and celebrated his victories by beginning a reign of terror. Then he had himself declared dictator in order to reorganize the state. The laws he passed restored the power of the Senate and the party of the nobles, but the laws did not last long. In 79 B.C. Sulla resigned and spent his last year in retirement. W.S.F.

**Related Subjects.** The reader is also referred to:

Dictator	Mithridates
Jugurtha	Patrician
Marius, Gaius	Praetor

**SULLIVAN, ANNE (MRS. JOHN A. MACY)** (1866-1936). See KELLER, HELEN ADAMS.

**SULLIVAN, ARTHUR SEYMOUR, SIR** (1842-1900), was an English composer of light operas and sacred music. In 1871 he began collaborating with Sir William S. Gilbert, who wrote the words to Sullivan's most successful comic operas. These include *The Mikado*, *The Pirates of Penzance*, and *H.M.S. Pinafore*. In 1890 Gilbert and Sullivan had a quarrel, and the two stopped producing operas together.

Sullivan was born in London, and sang in the Chapel Royal when he was twelve years old. His first composition, an anthem, was published when he was thirteen. The next year, he won the Mendelssohn scholarship at the Royal Academy of Music, and later continued his studies at the Leipzig Conservatory. At the age of twenty he became famous practically overnight after a performance in England of William Shakespeare's *The Tempest*, for which Sullivan wrote the music.

For some years he served as organist at St. Michael's Church in London, and conducted concerts. In 1866 he was appointed professor of composition at the Royal Academy of Music.

Sullivan directed the National Training School from 1876 until 1881, when it became a part of the newly founded Royal College of Music. In 1877 he set to music Adelaide Proctor's poem "The Lost Chord," which became world-famous. From 1885 to 1887 Sullivan was the conductor of the London Philharmonic Orchestra. K.L.B.

See also GILBERT, WILLIAM, SIR.

**His Works** include anthems and oratorios, such as *Light of the World*; a *Te Deum*; cantatas, most important of which is *The Golden Legend*; and many beautiful songs, such as "O Mistress Mine" and "Orpheus with his Lute."

**SULLIVAN, JOHN LAWRENCE.** See BOXING (World's Heavyweight Champions; illustration).

**SULLIVAN, LOUIS HENRI** (1856-1924), was the first architect to apply new artistic principles to the construction of skeleton-steel buildings. At the time of his major work, the skyscraper was already a reality through the work of William Jenney and others. (See JENNEY,

WILLIAM LeBARON.) To their triumph in engineering, Sullivan added his revolutionary principle of *functionalism*. He insisted that steel

and glass should look like steel and glass, and that a modern warehouse should not be disguised as a castle of the Middle Ages. He tried to build to suit the needs of a modern age, and he fought the borrowing of designs and ornaments from past periods as unsuitable for an age of new methods and materials. His now-famous maxim, "Form follows function," is the basis of modern architecture in America.



Elmelle  
**Louis Sullivan**, American architect who pioneered in modern building methods

Sullivan was born in Boston and studied at the Massachusetts Institute of Technology and at the École des Beaux Arts in Paris. After 1880, he practiced architecture in Chicago. His firm built the Auditorium Building, the Stock Exchange Building, and the Gage Building in Chicago. Their Wainwright Building in St. Louis, Mo.; their Transportation Building at the Chicago World's Fair of 1893, and their Guaranty Building in Buffalo, N.Y., all showed a revolutionary use of metal and glass that later became familiar in modern construction. M.C.C.

**His Works** include *Kindergarten Chats* and *The Autobiography of an Idea*.

**SULLY, THOMAS** (1783-1872), is considered the last of the "American Old Masters," the portrait painters who learned their craft in the London studio of Benjamin West. Sully painted more than 2,500 portraits. His early work shows the influence of Gilbert Stuart, particularly in its warmth and richness of color. His later work was influenced by Sir Thomas Lawrence, and many critics consider it oversentimental.

Sully was born in Horn-castle, England, and was brought to Charleston, S.C. as a child. He studied in London, and, in 1810, settled in Philadelphia, where he did most of his work. M.C.C.

See also PAINTING (Great American Paintings, color plate, Torn Hat).

**His Works** include "Portrait of Eliza" and "Portrait of Thomas Jefferson."

**SULPH.** For all words beginning with the syllable *sulph*, see *sulf*. Example, SULPHUR. See SULFUR.

**SUL ROSS STATE TEACHERS COLLEGE** is a state-supported, coeducational school for teachers at Alpine, Tex. It offers courses leading to B.S., B.A., and M.A. degrees, and works with Harvard University in excavat-



Chicago Historical Society  
**Sir Arthur Sullivan** wrote the music to William Gilbert's lifting comic opera lyrics.



Metropolitan Museum of Art  
**Thomas Sully**, American artist, painted this portrait of himself in the early 1800's.

ing prehistoric pit houses of an ancient people near Presidio, Tex. Sul Ross State Teachers College was founded in 1920. Average enrollment is about 500.

**SULTAN** is a title of honor which is given to Moslem princes and rulers. The word *sultan* means *emperor*, but in ancient days it meant merely someone who was stern and mighty. The title has been used since about A.D. 900. The ruler of the old Turkey was the greatest of the sultans. Today many sultans are wealthy, but few have the sweeping power of the ancient princes. See also AFRICA (color plate, Council Meeting in the Palace of the Sultan); SERAGLIO. M.F.L.

**SULTE**, *syult*, **BENJAMIN** (1841-1923), was a Canadian poet and historian. He wrote the eight-volume *Histoire des Canadiens-Français* (*History of the French Canadians*). Sulte was born in Three Rivers, Quebec, and worked for the government as a translator. W.S.W.

**His Works** include *Histoire de St. François du Lac* (*History of Saint Francis of the Lake*), a history of Quebec; and two volumes of verse, *Les Laurentiennes* and *Les Chants Nouveaux* (New Songs).

**SULU ARCHIPELAGO**. See PHILIPPINE ISLANDS (Principal Islands).

**SULU SEA** is also called the SEA OF MINDORO. It lies between the Philippine Islands and Borneo. The Sulu Sea is surrounded by the Visaya Islands on the northeast, Borneo on the southwest, and the Sulu Islands on the southeast. It is connected by straits with the South China Sea and the Pacific. The sea has an average depth of 14,600 feet. Near the western coast of Mindanao, it is more than 16,000 feet deep. H.U.S.

**SUMAC**, *SHOO mak*, or *SU mak*, or **SUMACH**, is the name of a group of small trees or shrubs that grow in temperate regions. There are about 120 kinds of sumac, many of which have commercial uses.

One of the best known of the North American sumacs is the *staghorn sumac*. It grows from southern Canada to Georgia and Mississippi. It is an attractive flat-

topped tree, growing thirty or thirty-five feet high. The tree bears small, greenish flowers and tiny red berries. Its fernlike leaves are velvety dark green above, and pale beneath. In the autumn the leaves turn to flaming scarlet, orange, and purple. Before the tree is mature, its forked branches are covered with a soft, velvety down. The berry clusters and leafstalks are extremely hairy. The staghorn's wood is soft and brittle and is used for walking sticks and inlay work for boxes and decorative objects.

The *dwarf*, *black*, or *mountain sumac* is as pretty as the staghorn. It is found throughout the Eastern United States and from the Mississippi River west to the Rockies. The dwarf sumac is usually a shrub, although in the Tennessee and North Carolina mountains it grows as tall as the staghorn. Its leaves contain much tannin and are used in tanning leather. They also provide a yellow dyestuff. The *smooth-leaved sumac*, which usually grows only about three feet high, is found east of the Rocky Mountains, from Arizona to British Columbia. The unripe summer berries are used in making a refreshing drink. The bark, leaves, and berries are used in treating fevers.

**Poisonous Sumacs** can be recognized because their berries always hang in drooping clusters. The red berries of the harmless sumacs are in dense, erect clusters. The *poison sumac*, or *poison elder*, has white berries. It is found in swampy land from New England to Minnesota and from Georgia to Texas. The *poison ivy*, or *poison oak*, also has white berries. It is very beautiful in autumn, with scarlet and orange foliage. In Japan, China, and the Himalayas live the *varnish tree*, or *lacquer tree*, and the *wax tree*. The lacquer tree provides paint lacquer, and the wax tree is used in making candles. Both are poisonous. J.J.L.

See also FLOWER (color plate, Flowers of Plants Harmful to Man and Animal); POISON IVY; POISON OAK.

**Classification.** The sumac genus, *Rhus*, belongs to the cashew family, *Anacardiaceae*. The staghorn sumac is *R. hirta*; the dwarf, *R. copallina*; the smooth-leaved, *R. glabra*; the poison, *R. venix*.

**SUMAROKOV**, *soo mah RO kohf*, **ALEKSANDR** (1718-1777). See RUSSIAN LITERATURE (Eighteenth Century).

**SUMATRA**, *soo M.II trah*, is one of the five large islands of the Netherlands East Indies, and next to Java in importance. It lies in the Indian Ocean, just southwest of the Malay Peninsula. The equator runs across the central part of the island. Sumatra covers an area of 164,148 square miles, and has a population of 7,677,826. Most of the natives are of Malayan and Hindu descent. Some of the natives are still savages. There are only a few white inhabitants.

Sumatra is crossed from end to end by a range of heavily timbered mountains. High volcanic peaks thrust their sharp points above this range. Many active volcanoes smoke and rumble without ceasing. The mountains slope down to the coasts, where there are low plains and marshes. The lowlands are covered with dense tropical jungles and heavy plant growth except where the land has been cleared for farming.

Sumatra has a hot, wet climate. The *monsoon* season brings great storms of pouring rain. Sumatra's tropical forests shelter many kinds of wild animals, including

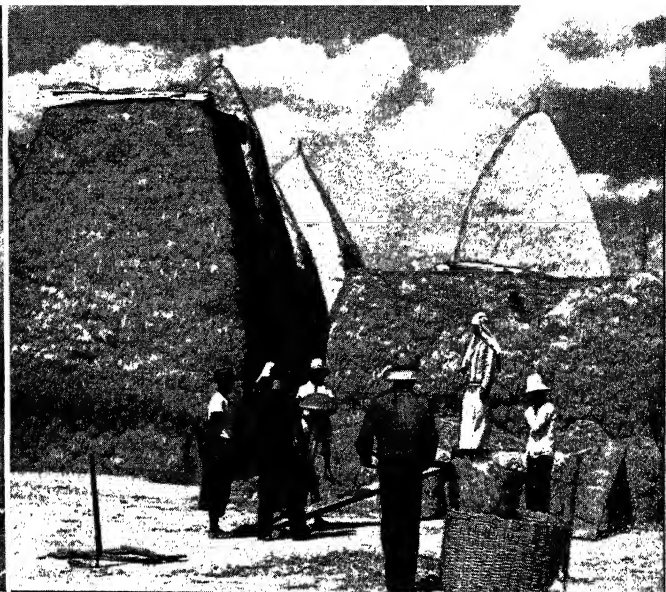


J. Horace McFarland

Leaves and Berry Cluster of the Smooth-leaved Sumac



**A Girl of Sumatra** sorts and packs the leaves of fragrant Sumatra tobacco.



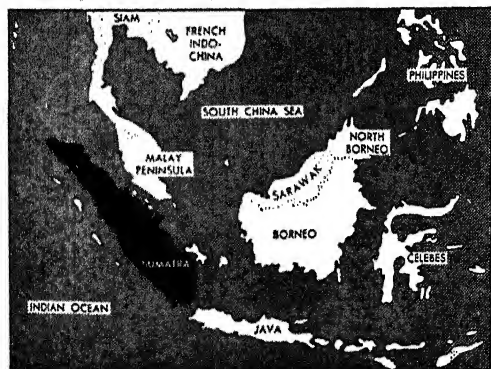
**Rice Is Stacked in Tall Pyramids** before it is threshed on a farm in southern Sumatra. Threshing is done with flails, on the concrete floor.

tigers, elephants, wild boars, and two-horned rhinoceroses. Sumatra is famous for its many kinds of apes and monkeys. Sportsmen come from many countries to hunt the Sumatran deer.

Tropical birds with bright colored plumage are found everywhere on the island. The jungle air is filled with their shrill calls and songs. Sumatra has many kinds of poisonous snakes, including the king cobra and the pit viper. The giant python is also common in some parts of the island.

Sumatra has a wealth of natural resources, and carries on a large trade with Chinese, European, and American ports. The island has rich mineral deposits, including lead, silver, sulfur, and coal. Teakwood, bamboo, and valuable gums are taken from the heavy forests. Much of the jungle has been cleared to make room for modern rubber plantations. Sumatra is now one of the world's chief sources of rubber.

Other crops grown in the fertile valleys and lowlands include pepper, tobacco, rice, coffee, tea, and sisal. The island's great petroleum fields bring large profits to foreign owners. Petroleum industries led to the development of the oil center of Palembang in the southeast, and the port of Padang on the west central coast.



**Location Map of Sumatra**

**History.** In 1508 a Portuguese explorer first brought back to his country the story of Sumatra's riches. The first European trading posts on the island belonged to Portugal. In the 1600's the British founded a colony on the southwestern coast of Sumatra. In 1618 The Netherlands also set up colonies in Sumatra. For many years, Great Britain and The Netherlands competed for control over the island. The British finally left Sumatra in 1824.

**Sumatra during World War II.** Japanese troops launched an attack on Sumatra soon after the fall of Singapore. The invaders captured the oil center of Palembang in February, 1942. By March 27, all of Sumatra had fallen to the Japanese. The Dutch had destroyed many oil wells and refineries, but the Japanese were able to make repairs within a few months. Fuel stores from Sumatra helped Japan to continue its offensive in the East. The fall of Japan in 1945 again brought Sumatra under the control of The Netherlands.

**Government.** A governor-general appointed by the ruler of The Netherlands heads the administration of Sumatra. He is assisted by a council and district governors, but his power is absolute. Since 1917 natives of Sumatra have been given representation on a legislative assembly which is called the *Volksraad*. In 1925 the natives received more powers of self-government. But the real control still lies with the governor who is directly responsible to the home government in The Netherlands.

E.E.E.

See also EAST INDIES (map); MALACCA, STRAIT OF.

**SUMERIAN**, *syu MEER ih an*. See ANCIENT CIVILIZATION (Tools); BABYLONIA (History).

**SUMMARY.** A summary is the summing up or totaling of preceding information. It is a brief and concise restatement of important points for the sake of emphasis. All unessential words, facts or information are left out of a summary. Written pieces of composition are frequently summarized in the last paragraph. See also OUTLINES AND OUTLINING.

S.M.S.

**SUMMER** is the warm time of the year when the sun shines most directly on one half of the world. Summer in the Northern Hemisphere begins officially on June



20, 21, or 22, Greenwich Time, and ends on September 22, 23, or 24. Usually July and August are the two hottest months. Field crops, trees, and other plants reach full maturity during the summer.

When the sun is highest over the Northern Hemisphere, it is lowest in the Southern Hemisphere. The warmest months in the United States are the coldest months in Australia, and in the southern part of South America and Africa. December, January, and February are the growing seasons in Australia, Argentina, and other countries of the Southern Hemisphere. These months compare with June, July, and August in the northern part of the world.

P. SO.

See also AUGUST; DOG DAYS; HOME LIFE (color plates); JULY; JUNE.

**SUMMERALL, CHARLES PELOT** (1867- ), was the eighth officer of the United States Army to reach the rank of general. From 1926 to 1930 he was chief of staff of the army. Summerall was born at Lake City, Fla. He was graduated from the United States Military Academy in 1892. During World War I he took part in five major battles in France. After the war he served as a member of the Inter-Allied Military Commission at Fiume. Summerall retired in 1931 and became president of The Citadel, a military school in South Carolina.

F.T.M.

**SUMMERSIDE**, Prince Edward Island (population 5,034). This port is one of the centers of the silver-fox breeding industry of Prince Edward Island. It lies in the richest farm lands of the island. Summerside was once called Green's Shore, but its name was changed because it lies on the warmer or "summer" side of the island. The town is situated on Bedeque Bay, about five miles south of Malpeque Bay, which is famous for fine oysters. Large amounts of farm and fish products are shipped from Summerside. The headquarters of the Canadian National Silver Fox Breeders' Association and the Dominion Fox Experimental Station are in Summerside.

D.C.H.

**SUMMONS**. A summons is an order or notice to appear in court. It is served by an authorized officer. The summons must state the purpose for which a person is expected to appear. See also SUBPOENA.

H.CAL.

**SUMNER, CHARLES** (1811-1874), was an American statesman and antislavery leader. After the War between the States, he believed in treating the defeated South harshly. He led the Senate's opposition to Abraham Lincoln's and later to Andrew Johnson's moderate plans for reconstruction.

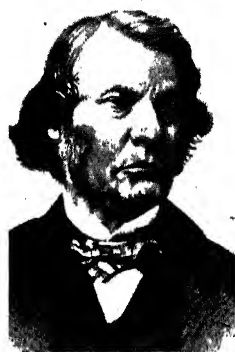
Sumner was born in Boston and studied at Harvard Law School. In 1834 he was admitted to the bar and for a time taught law. He became popular as a lecturer on peace and on abolition, and in 1851 he was elected United States Senator from Massachusetts.

He was so outspoken in his hatred of slavery that in 1856 a Southern Congressman attacked and beat him. Sumner was seriously injured and was an invalid for three years. Late in 1859 he resumed his seat in the Senate and remained a member until his death.

Sumner was one of the founders of the Republican party, and when that party came into power in 1861 he became one of the most powerful men in the Senate. During the War between the States, he fought to have the slaves freed, and later to have them given the right to vote.

When Ulysses S. Grant became President, Sumner opposed his policies and joined the Liberal Republican party.

W.B.H.



Brown Bros.

**Charles Sumner** was a leader in the U.S. Senate for twenty-three years.

**SUMPTUARY, *SUMP tyoo er ih*, LAW.** The word *sumptuary* comes from a Latin word which means *expenditure*. In ancient Greece and Rome, the amount of money that anyone could spend on private luxuries was limited by law. Limits also were set on the cost of funerals and banquets. Laws of this kind were called *sumptuary laws*.

Similar laws have been common at various times in England, France, Scotland, Spain, and Italy. From the days of Edward III (1327-1377) until the Reformation in the early 1500's, the English Parliament restricted the number of courses of a meal to two, except on holidays. It also regulated the amount of money which members of each class of society could spend on clothes.

In the United States, the term *sumptuary law* is applied to any regulation of a person's conduct intended solely for his own benefit. Most laws prohibit a person from injuring others. Sumptuary laws are supposed to make him "be good," or to make a conformist of him. For example, several states have had laws prohibiting the use of cigarettes. Prohibition, or prohibitory laws, forbid the use of alcoholic liquors and are intended chiefly to protect public health and morals, but they are in part sumptuary laws. The Blue Laws of colonial New England were in some cases sumptuary laws, within the modern meaning of that term, because they were meant to regulate persons' behavior.

S.T.K.

See also BLUE LAWS; PROHIBITION.

**SUMTER, S.C.** (population 15,874), is the county seat and marketing center of Sumter County, which is one of the leading farming and lumbering regions of South Carolina. The city lies about forty miles east and south of Columbia. The chief industries of the city are furniture manufacturing and other woodworking, and the dressing of squab for hotels and restaurants. Sumter was founded in 1785. It was named for General Thomas Sumter, the "Gamecock" of the Revolutionary War, whose home is near by.

R.L.Me.

**SUMTER, FORT.** See FORT SUMTER.

**SUMTER, THOMAS.** See SOUTH CAROLINA (Famous Men and Women).



Wide World

**Charles Summerall** was one of the leading American generals of World War I.

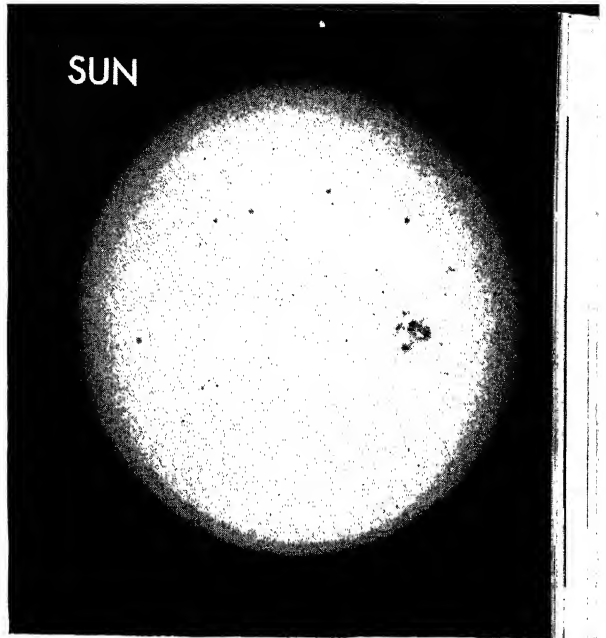
## SUN

**SUN.** The sun is by far the brightest object in the sky. It is the center of the solar system, and the earth and other planets revolve about it. Yet the sun is a typical star, and quite an insignificant one. If it were as far away from the earth as the stars in the Big Dipper are, we could not see it without using a telescope. At that distance the brightest star in the Dipper would be nearly fourteen thousand times brighter than the sun. Yet to the earth the sun is the most important of all heavenly bodies. The sun's heat and light make all forms of life on the earth possible.

**Size, Make-up, and Weight.** The diameter or distance through the sun is about 865,000 miles. This is 109 times the diameter of the earth and 400 times the diameter of the moon. The moon and the sun appear to be of almost equal size in the sky because the moon is so much nearer to the earth than the sun. The sun is a million times as big as the earth. But the bright red star Betelgeuse in the constellation of Orion is more than a million times as big as the sun. If the sun were placed at the center of the star Betelgeuse the planets Mercury, Venus, Earth, and Mars could all revolve about the sun at their present distances and yet remain well within the surface of that huge star.

The sun is made up of much the same chemical elements as are found in the crust of the earth. Some of these elements are much more abundant in the sun than they are in the earth. Among the most conspicuous elements in the sun are hydrogen, calcium, sodium, magnesium, and iron. There are still many elements in the earth that have not been seen through the spectroscope, an instrument which analyzes sunlight. It is probable that every known element in the earth may be found in some amount in the sun.

The sun is made up of gases. It is very dense at the center, but the gases are much less compact at the surface. Its average density is 1.41 times that of water, while the average density of the earth is about  $5\frac{1}{2}$  times that of water. The sun is very much lighter, volume for volume, than the earth, but there is so much of it that its total mass is 331,950 times that of the earth. The force of gravity at the surface of the sun is nearly twenty-eight

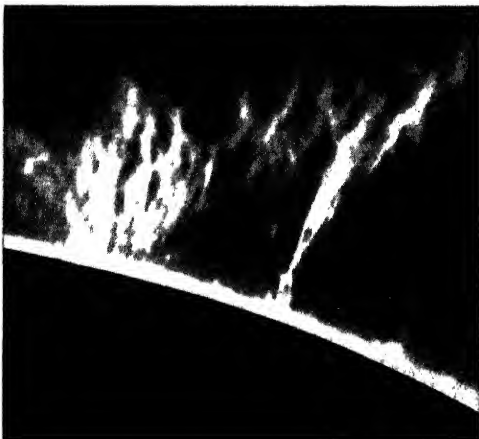


Yerkes Observatory

times the gravitational force at the surface of the earth. If a man weighing 150 pounds on the earth could be carried to the sun, he would weigh nearly two tons. A human being would find it impossible to lift a hand or foot on such a strange world.

**Parts of the Sun.** The surface of the sun cannot ordinarily be looked at safely with the naked eye. Near sunrise or sunset, however, when much of the bright light of the sun has been absorbed in the earth's atmosphere, its red disk can often be viewed safely without injuring the eyes. This round disk is the bright surface which gives off light and heat and is called the *photosphere* which means *light sphere*. Over the photosphere is an envelope made up chiefly of hydrogen and calcium gases. It is brilliant red in color and can be seen during total eclipses of the sun. This red layer is called the *chromosphere*, which means *color sphere*. Huge flames of hydrogen gas are often seen to burst forth in this chromosphere. These flames may suddenly stretch a hundred thousand miles or more. Outside the chromosphere there is still another envelope of gas that is called the *corona*. This can not ordinarily be seen, but it is visible during total eclipses of the sun as a pearly greenish halo stretching away from the sun often for a distance of more than a million miles.

**Sunspots.** When we look at the sun through a suitable telescope, we frequently see the photosphere covered with dark specks or blotches. These are known as sunspots. Sometimes these sunspots are large enough to be seen with the naked eye through dark colored or smoked glass screens. Occasionally they may be seen by the naked eye on the red disk of the setting sun. Galileo saw sunspots with his newly built telescope in 1610. They appeared to be slowly drifting across the sun's disk, and so he concluded from their motion that the sun must be rotating on an axis as the earth does. In reality sunspots are terrific storm centers in the sun's atmosphere. As we look down on these storm centers they appear very much as a tornado would appear to an airman flying over the top of one of those twisters. It has been found from care-



Mt. Wilson Observatory

Flames of Hydrogen Gas, called a "prominence," swirl more than 80,000 miles high from the surface of the sun.

ful study that these gigantic cyclones on the surface of the sun consist of whirling gases made up of electrified particles. A magnetic field exists about every sunspot. Sunspots very frequently appear in pairs. If one of the spots in the pair is positive magnetically, the other one is usually negative magnetically, just as are the two poles of a magnet.

Sometimes sunspots are much more numerous than at other times. From more than three hundred years of observations, it has been determined that they tend to appear and disappear during an average period of a little over eleven years. During the years when there are few sunspots, there may be days when no spots at all can be found on the sun's surface.

**Temperature.** The temperature of the surface of the sun has been determined to be about 12,000° Fahrenheit. In the center of a sunspot the temperature is probably several thousand degrees less. Toward the interior of the sun, however, the temperature rises rapidly. It has been estimated that at the center of the sun the temperature must be as high as 20,000,000° centigrade or 40,000,000° F.

#### Location and Movement.

The sun is the center of the solar system, which is made up of the planets Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto, with their satellites. Comets and swarms of meteors also circulate about the sun (see SOLAR SYSTEM). The sun's average distance from the earth is 92,900,000 miles. This distance could be covered in about ten years by a rocket ship traveling a thousand miles an hour. But human travel toward the sun would be extremely improbable, because of the sun's great heat. Radar waves, which travel with the speed of light, could cover the distance in eight minutes.

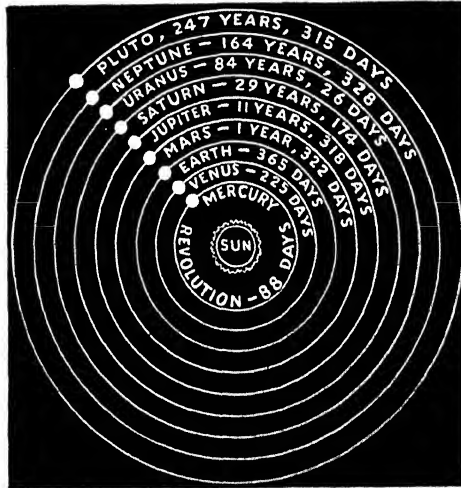
The nearest star, on the other hand, is more than 265,000 times as far away as the sun. A radio news flash from the nearest star would be four years old before it ever reached the earth. The sun is one of thirty billion stars that make up the Milky Way. It would take light a hundred million years or more to cross from one side of this Galactic system to the other. The sun is a little more than halfway from the center to the edge of the Milky Way.

In addition to the apparent daily and yearly movements of the sun due to the earth's motions, the sun has two movements of its own. It rotates on its axis just as the earth does. Instead of turning on its axis once in twenty-four hours as the earth does, it takes about twenty-five days for one rotation. Even this rotation is not uniform. The sun turns more rapidly at its equator than it does at higher latitudes. This, of course, could not happen if the sun were a solid body like the earth,

but only because the sun is a globe of glowing gas. The time of the rotation of the sun is determined by the rate at which sunspots are seen to move across its surface. Besides its rotation the sun is moving through space among the stars at a speed of about 12 miles a second, or 40,000 miles an hour, with respect to the nearer stars. The earth with the other planets is carried along with the sun so that the actual path of the earth's motion in space is a gigantic helix, or screwlike curve, resembling a winding staircase. At the beginning of each year the earth is not at the same point but is 400,000,000 miles farther on in its journey through space. It also is probable that this group of stars within which the sun is moving circulates about the center of its galaxy (the Milky Way) in about two hundred million years.

#### Where the Sun Gets Its Heat.

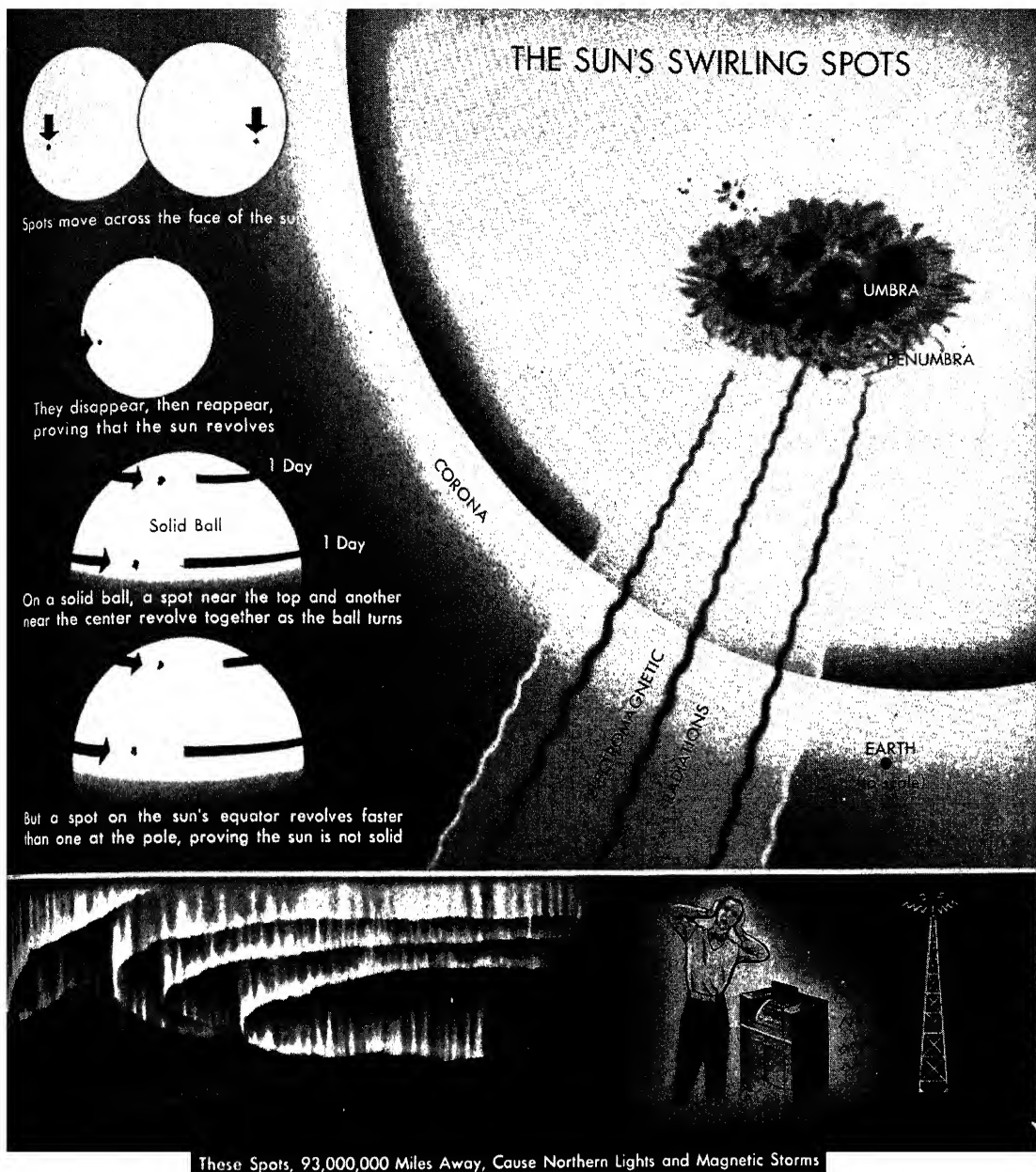
Geologists tell us that the earth must be at least two billion years old. For a considerable part of this time the earth must have been receiving about the same amount of light and heat from the sun as we receive today. It has long been a puzzle to astronomers to find out in what way this enormous storehouse of heat and energy could be kept up. If the sun were a solid lump of burning coal it would have been burned up in a mere 1,500 years. We know now that the source of heat and light from the sun must come from energy given off by atoms. The simplest of all atoms is hydrogen, which physics tells us is made up of an electrically charged positive nucleus, called the *proton*, and



**Comparison of Time** planets take in revolving around the sun. Mercury makes the circuit in 88 days. Far-off Pluto takes more than 247 years.

a tiny particle of negative electricity, called the *electron*. The hydrogen atom is a building block from which other elements can be made. The next simplest atom is helium. Its atomic weight is about 3 per cent less than the weight of four hydrogen atoms. We believe that inside the chemical laboratory of the sun's interior, hydrogen is constantly being changed into helium. The 3 per cent loss of weight in this transformation is radiated into space as light and heat. But this is not a simple process. Professor Bethe of Cornell University has shown that much assistance is needed on the part of carbon to make this possible. We know that there is plenty of carbon in the sun as well as hydrogen. When the nucleus of a carbon atom encounters the nucleus of a hydrogen atom (a proton), the proton is absorbed and we get a light-weight form of nitrogen in place of the original carbon atom.

This form of nitrogen is radioactive. It readily changes into another form of carbon a little heavier than the first. In the hurly-burly of atoms within the hot sun this carbon atom will change into ordinary nitrogen when it is struck by another proton. When this nitrogen gets hit by another hydrogen nucleus it turns into a form of oxygen which is radioactive. Later on it becomes



another and more stable form of nitrogen. When this stable form of nitrogen is in turn hit by a proton it splits up into two entirely different kinds of atoms. One of these is ordinary carbon with which we started our operation, and the other is helium. When we get through this manufacturing process we have the carbon atom with which we started. Hydrogen has been used up in the process and helium has been made. The oxygen and nitrogen were incidental in the process.

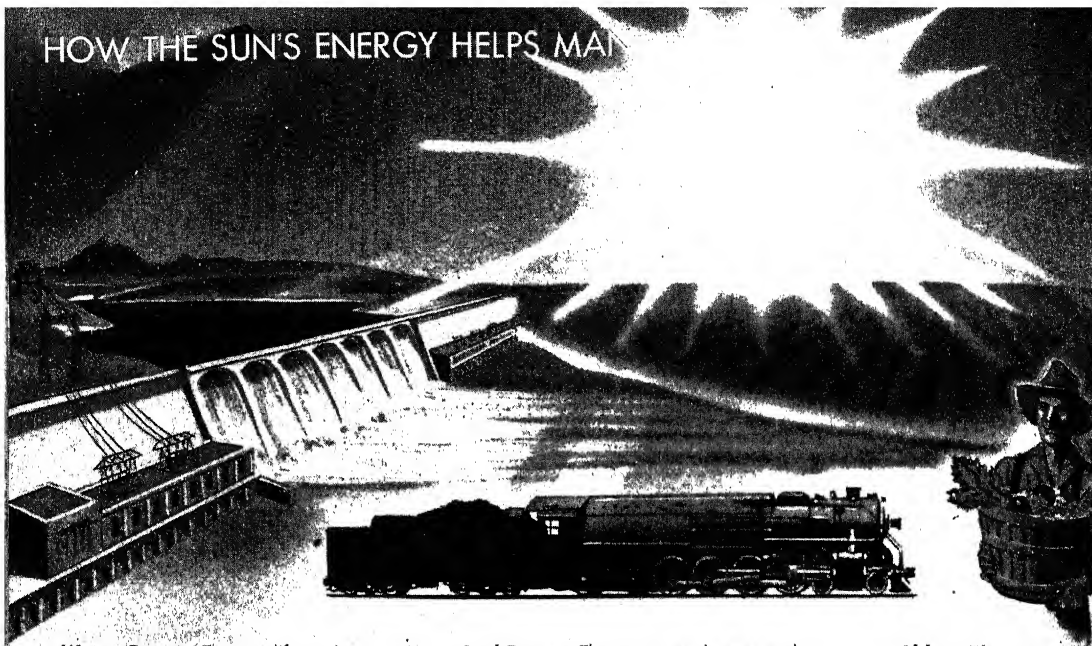
It has been suggested that scientists working on the problem of atomic energy may try to duplicate this process to some degree.

What actually happened is that for every four hundred grains of hydrogen changed into helium about

three grams of matter were lost in the form of heat and energy. It has been found that the energy released in this process is sufficient to keep the sun's temperature at its present value for thirty-five billion years, even though the sun is losing weight in the process at the rate of over four million tons a second. After that the sun will gradually lose temperature and ultimately become cold and dark, unless it is rejuvenated by collision with another star, or through an atomic explosion such as is seen to take place occasionally in some of the other stars in the universe.

**The Sun and the Earth.** Because of its small size and great distance, the Earth receives only one two-billionth part of the heat given out by the sun. Yet it is this small

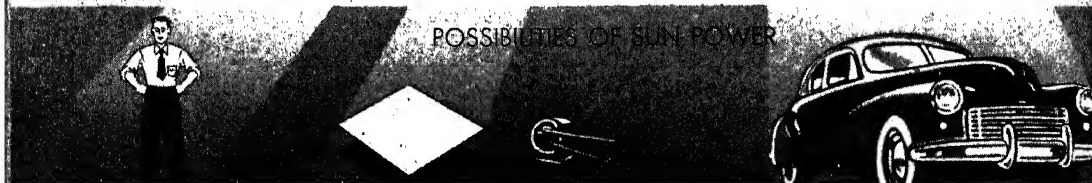
## HOW THE SUN'S ENERGY HELPS MAN



**Water Power.** The sun lifts moisture and forms rain which runs into rivers for hydroelectric power.

**Coal Power.** The sun stores its energy in coal. Coal runs giant trains and factories.

**Aid to Plant Life.** Sun gives man's food Vitamin which is necessary for health.



trickle of solar energy that is responsible for all activity on the earth. Every year the sun's heat evaporates 480,000,000 tons of water from the oceans and streams. It lifts the vapor into clouds a mile high where it condenses in the form of rain. This moisture falls again to earth, making possible all vegetation and releasing millions of horsepower from flowing streams and waterfalls. Every square yard of the earth's surface on which the sun shines could yield us one and a half horsepower of energy if we knew how to use it. Experimental solar engines have already been designed by various inventors from time to time, but so far their efficiency has been very low. Some day man may devise an efficient engine which will convert this vast storehouse of solar energy into mechanical work. Some machines already make some small use of this power.

Furthermore, the ultraviolet rays falling on the top of the atmosphere highly electrify, or *ionize*, the atmospheric molecules. In doing this they provide an electrical ceiling from which long-distance radio waves are reflected back to earth. This makes radio communication possible.

The amount of light and heat from the sun received

at the surface of the earth varies but slightly, perhaps 1 or 2 per cent. Yet the behavior of radio waves tells us that one hundred miles up the ultra violet rays of the sun must vary greatly between the sunspot maximums and sunspot minimums. On account of the change in electrical conditions in the upper air, different frequencies are used in world-wide radio communication during the years when sunspots are numerous from those used when sunspots are few.

Magnetic changes also take place in the earth when spots break out on the sun. Compass needles become unsteady and sometimes wander a degree or more from their normal position during one of these magnetic storms. It is believed that electrified particles are shot earthwards from sunspots. These highly electrify the upper atmosphere, cause the displays of the northern lights, and upset radio communication. Sometimes when there is an unusual explosion of hydrogen gas on the sun, all radio communication is suddenly blacked out. This is believed to be due to the sudden ionization of the upper atmosphere produced by a great burst of ultraviolet light given off from these hydrogen flames on the sun. Radio engineers are therefore very much



interested in what happens on the sun, and in the prediction of sunspots. Radio has become a very valuable tool in studying variations in the sun's rays at the top of the atmosphere. Daily records are constantly being kept of all solar disturbances and the state of ionization of the upper air.

**Sunlight, Health, and Climate.** Most of the ultraviolet light from the sun is absorbed by a layer of ozone in the atmosphere about twenty-five miles high, otherwise we should all be fatally sunburned. On the other hand, the ozone layer is just thick enough so that a small amount of ultraviolet sunshine comes through to the earth. This ultraviolet light gives us the vitamin D in our foods and bodies which is so necessary for health. If the ozone layer were a little thicker, these health-giving rays of the sun would be shut off from the earth. We should all die of rickets unless vitamin D were artificially supplied in some other manner. The ozone sometimes varies in thickness or density. This is the reason why one sunburns more readily in some seasons than in others. Thus we see that the changing radiation of the sun in the sunspot cycle has its effects on the lives we lead. It also has been found that the growth of trees has varied with the sunspot cycle. Tree rings found in stumps vary in width depending upon the rate of annual growth. By studying selected specimens we can identify the years of the most and fewest sunspots going back thousands of years. In this way climatic cycles in the world's history have been determined from studying the giant redwood and Sequoia trees found in California.

**Superstitions and Myths about the Sun.** The sun is so important to the earth that sun worship has existed since the earliest times. Primitive nations regarded the sun as a god which was worshiped with great ceremony. To the Greeks the sun was a fiery chariot which Apollo drove across the sky each day. Relics of sun temples are found in Europe, South America, India, China, and elsewhere. These indicate that primitive tribes attached great significance to the movements of the sun.

Astronomy is the oldest of the sciences. The earliest astronomers built obelisks and pillars. From the length and the position of the shadows cast by these objects they could tell when the sun was farthest north and farthest south and arrange their calendars accordingly. To certain people the year began when the sun was at the equinox in the spring of the year. The sun then rose exactly east and set exactly west. When it was farthest north it was the summer solstice, and when it was farthest south, the winter solstice. These events also were the occasions of ceremonies and religious rites. In literature, including the Bible, there are many allusions to the sun. The Romans called the sun Sol. H.T.S.

**Related Subjects.** The reader is also referred to:

Corona	Gravitation	Solar Engine
Earth	Midnight Sun	Solar System
Eclipse	Planet	Solstice
Equinox	Rainbow	Sunspot

#### Outline

- I. Size, Make-up, and Weight
- II. Parts of the Sun
- III. Sunspots
- IV. Temperature

#### V. Location and Movement

#### VI. Where the Sun Gets Its Heat

#### VII. The Sun and the Earth

#### VIII. Sunlight, Health, and Climate

#### IX. Superstitions and Myths about the Sun

#### Questions

How large is the sun? How large is the sun compared with the earth? With the moon?

Why does the moon sometimes appear almost as large as the sun in the sky?

If it were possible for a man weighing 150 pounds to be carried to the sun, how much would he weigh there? Why?

What are the parts of the sun that can be seen? When is the corona visible?

What are sunspots? What causes them?

How hot is the temperature at the surface of the sun? How hot has it been estimated to be at the middle?

How far is the earth from the sun? How long would it take to travel this distance going about a thousand miles an hour? How long does it take light to travel from the sun to the earth?

About what part of the sun's heat does the earth receive? How important is this heat in the lives of human beings?

What keeps people on earth from being fatally sunburned?

What necessary vitamin is supplied by the sun?

**SUN BATH.** See HELIOTHERAPY.

**SUN BEAR.** See BEAR (Kinds of Bears [Other Bears]).

**SUNBIRD** is the common name of a group of tiny tropical birds of Asia and Africa. They are like the hummingbirds of the New World, which they resemble in size and in the gay color of the feathers of the male. They are larger than most hummingbirds, however. Their bills are curved instead of straight as are those of the hummingbird. They feed to some extent on flower nectar, but their food consists chiefly of the tiny insects that fly about flowers. A.A.A.

**Classification.** Sunbirds belong to the order of sparrow-like birds, *Passeriformes*, while the hummingbirds, with the swift, make up the order *Micropodiformes*. The sunbirds belong to the family *Nectarinidae*.

**SUNBURN** is an inflammation of the skin caused by exposure to the sun's rays. A sun tan may be healthful, but a sunburn can be serious. The victim may suffer severe pain and discomfort. He may feel quite ill and even have a fever. A person can get a sunburn without being aware of it. Even on cloudy days it is possible to get a severe sunburn. The sun rays filter through the clouds. Sun rays reflecting from a body of water, or from ice, snow, or sand, increase the amount of burning. Such a burn is usually first or second degree.

Sunburn can be prevented by gradual exposure to the sun. The length of time spent in the sunlight each day can be increased as a protective coat of tan is built up. If extensive exposure to the sun is unavoidable, a robe or covering of some kind should be worn part of the time. Olive oil or a good sun tan ointment on the skin also helps as a preventive.

For the treatment of sunburn, the Red Cross suggests the application of calamine lotion. This is a soothing lotion which does not stain the clothes. Oils like olive oil and cocoa butter also provide relief. In severe cases a wet dressing of Epsom salts solution is recommended.

A dressing of sterile gauze should be used for serious blistering. In case there is fever, a doctor should be called.

W.R.L.A.P.

See also **FIRST AID** (Burns and Scalds).

**SUNDA**, *SUN dah*, or **SOENDA, ISLANDS** are two groups of islands in the Netherlands East Indies. The Sunda Islands stretch from the Malay Peninsula east to the Moluccas. They are divided into the Great Sunda and Lesser Sunda Islands. The Great Sunda Islands include Sumatra, Java, Borneo, Celebes, Bangka, and Billiton. The Lesser Sunda Islands include Bali, Lombok, Soembawa, Flores, Soemba, and Timor.

The islands are fertile and productive. They carry on a large trade in spices, fruits, copra, rice, coffee, cocoa, tobacco, and sugar. Except for the British section of Borneo and Portuguese Timor, all the Sunda Islands are ruled by The Netherlands. They were occupied by the Japanese during World War II, but were surrendered to the Allies after the fall of Japan.

E.F.H.

See also **BALI**; **BORNEO**; **CELEBES**; **JAVA**; **SUMATRA**.

**SUN DANCE**. This was a religious dance of the Plains Indians of early North America. Today the dance is not common, but some tribes still perform it for tourists. The United States Government has forbidden the ceremony in most places because of the human tortures that once went with it.

The sun dance was held in the summer or early autumn of each year. It often lasted for eight days. Preparation ceremonies took up the first few days. The last days were given over to the dance itself. The dance was held in honor of the Indian sun god. The Indians thought it would bring them good fortune.

Tribe members grouped their tipis in a circle around the lodge of the medicine man. Each tent had an opening which pointed in the direction of the rising sun. The Indians then painted their bodies with bright colors and danced around the center pole of the tent. Each tribe had various religious ceremonies that carried a special meaning. Some of these were very savage and cruel.

W.D.H.

See also **INDIAN, AMERICAN** (color plate).

**SUNDAY** is the first day of the week among Christian peoples. It is the day set aside for rest and for worship of God. Sunday was the day sacred to the sun among the old Teutonic peoples, and its name means the "day of the sun." The French call Sunday *dimanche*, the Spanish call it *domingo*, and the Italians call it *domenica*. These three names all come from the Latin words *Dies dominicus*, which means Lord's Day.

The early Christians lived hard lives, and had to work on Sunday as well as the other days in the week. But they made Sunday a day for special worship, because the resurrection of Jesus occurred on that day. By the A.D. 300's, both the church and the state officially recognized the day as a day of rest in Europe.

Some of the states of the Union still have laws forbidding labor on Sunday, and a few states and communities even have laws prohibiting amusements, such as ball games and motion pictures, on Sunday. Such laws are called *Blue Laws*. Government departments are all closed on Sunday. So are all banks, and almost all businesses.

See also **BLUE LAWS**; **WEEK**.

**SUNDAY, "BILLY," WILLIAM ASHLEY** (1863-1935), was a baseball player who became a famous evangelist. "Billy" Sunday preached crude, conservative sermons, but his ability to sway emotions led to his winning about 300,000 converts. The tabernacles in which he preached usually had sawdust on the floor, and so when

his converts came up to the altar they were said to be "hitting the sawdust trail."

Sunday was born in Ames, Iowa, a month before his father was killed in the War between the States. He spent much of his childhood in an orphan's home, and then supported himself by working at odd jobs. From 1883 until his conversion in 1890, he played in turn on the Chicago, Pittsburgh, and Philadelphia baseball teams of the National League. Three years later he became a Presbyterian

W.W.S.



BROWN BROS.

"Billy" Sunday was a colorful American preacher.

minister and began his evangelistic work.

**SUNDAY SCHOOL**. Sunday schools are usually organized in connection with Protestant churches, to teach Bible study and religion. The Sunday school movement was started in Gloucester, England, by a publisher named Robert Raikes. In 1780 he launched his "Ragged School." He tried to aid the children of the poor in his community by teaching them reading, writing, and the principles of religion. The children were quick to show interest in the Sunday meetings. The schools received publicity through Raikes's newspaper. John Wesley, George Whitefield, and even Queen Victoria gave them support. With the great modern "foreign" missionary work of the 1800's and 1900's, the schools were carried to all parts of the world. When Raikes died in 1811, 400,000 children were enrolled in Sunday schools. Today about 38,000,000 children and adults attend more than 360,000 Sunday schools.

In America, Sunday schools were first organized by the Methodists after the Revolutionary War. The American Sunday School Union was formed in 1824. It established thousands of schools by sending missionary workers to all parts of the country. Another one of the important Sunday school organizations was the International Sunday School Association, which served the United States and Canada. In 1924 this organization became the International Council of Religious Education. There is also the World Sunday School Convention, which had its beginning in London in 1889. This group helped to establish many national associations or councils of Christian education throughout the world. The World Convention has more than fifty national and international bodies in its membership.

The modern Sunday school is divided into departments for students of various ages. A superintendent is in charge of each department and a teacher is in charge of each class. A uniform course of lessons is widely used



Keystone

Children Attending a Sunday School Bow Their Heads as They Recite a Prayer Learned from the Teacher

in the United States and Canada. It is outlined by the International Council of Religious Education, which also prepares outlines for graded lessons. Many schools use a graded system of lessons. Other features of modern Sunday school work are classes for teachers, Sunday school workers' institutes which help train the teachers and enable them to exchange ideas, conventions, and circulation libraries.

F.L.K.

See also COMMUNITY (Forum); RAIKES, ROBERT; RELIGIOUS EDUCATION; VINCENT, JOHN HEYL.

**SUNDERLAND.** See ENGLAND (Cities).

**SUNDEW, SUN *hyoo*.** The sundews are a group of interesting plants that trap and digest insects. These plants live in bogs and marshes. They are so named because drops of sticky fluid secreted by glands appear on their leaves. In the sunlight, these drops glitter like drops of dew. The *round-leaved sundew*, which grows in moist places over the northern part of the United States, and from Labrador to Alaska, is the most common species.

The slender stem of this plant, five inches or less in height, is topped by small white flowers. At the base of the stalk, springing from the root, is a rosette of rounded leaves. The upper surface of each leaf is covered with gland-bearing hairs. Each gland is the center of a drop of the sticky liquid. When an insect alights on a leaf, it becomes stuck in the fluid. The tiny hairs which it touches bend. The victim is passed from one set of hairs to the next, as the leaf curls in, until the captive is in the center of a cup-shaped receptacle. Here it is drowned in the fluid. Parts of its body are then digested and absorbed.

P.C.S.

See also CARNIVOROUS PLANT.

**Classification.** The sundews form the genus *Drosera* in the family *Droseraceae*. The round-leaved species is *D. rotundifolia*.

**SUNDIAL.** This is the oldest device known for the measurement of time. It is based on the fact that the shadow of an object will move from one side of the object to the other as the sun moves from east to west during the day. The sundial is believed to have been used in Babylon at least as early as 2000 B.C.

The earliest description of a sundial comes from



Ewing Galloway

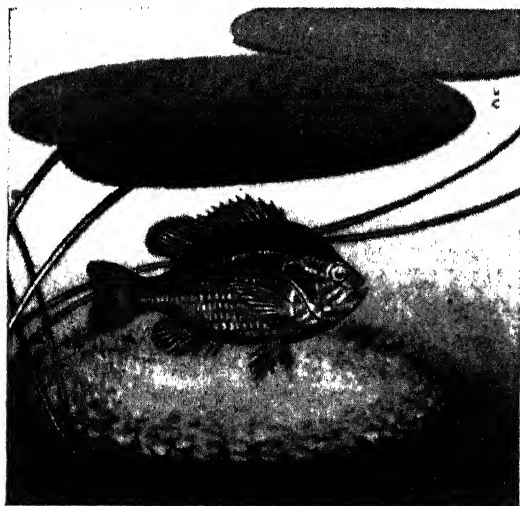
**This Unusual Sundial in Baltimore, Md.,** tells approximately correct time in the world's principal cities. It is night in the cities shown in the deeper shadows.

Berosus. He was a Chaldean astronomer who lived about 300 B.C. His sundial was a hollow half-sphere, or dome, set with its edge flat. A small bead was fixed at the center. During the day the shadow of the bead moved in a circular arc. This arc was divided into twelve equal parts. Thus, daylight was divided into twelve equal parts. They were called *temporary hours* because they changed with the seasons. *Equal hours* were decided upon about A.D. 1400, when clocks were invented. Few sundials were used after the end of the 1700's.

A sundial is made up of two parts, the *dial face*, or *plane*, and the *style*, or *gnomon*. The dial face is divided into quarters. The dividing lines run toward the four points of the compass. The horizontal dial is further marked into hours and half and quarter hours. The gnomon is a flat piece of metal, set in the center of the dial and pointing toward the North Pole. On sundials used in the Southern Hemisphere, the gnomon must point to the South Pole. The angular elevation of the indicating edge of the gnomon above the horizontal plane must equal the latitude of the location. R.E.G.

**SUNDOG.** See HALO.

**SUNFISH.** There are several kinds of fish to which this name is given. In the fresh waters of North America, the sunfishes are a group of small, bright-colored food fish, rarely over ten inches long. Their color changes according to conditions of health, food, and temperature. The males become brightly colored in the breeding seasons. They clear out a nest on the bottom of a lake or stream and guard the eggs against intruders. The most widely favored game fish among the sunfishes proper (except for the black basses, which belong to the same family) is the *bluegill*. The pumpkin seed fish, a kind of sunfish, is found abundantly in brooks and ponds from Maine to Florida, and in the northern part of the Mississippi Valley. It has a roundish body and there is considerable orange in its color. There is a bright red spot on the ear flap. This fish is about



**The Sunfish Builds a Nest** in shallow water. During the breeding season, it will defend its young courageously against all comers. It is a favorite game fish of the bamboo-pole angler, who baits his small hook with worms.

inches long and weighs from six to eight ounces. Boys enjoy fishing for it, because it bites with so much vigor. These sunfish are usually caught with worms as a bait. Other species also are common. Some of the smaller, more brilliant kinds are kept in home aquariums.

The name sunfish also is given to a group of grotesque-appearing ocean fish which have the habit of resting on the surface in sunny weather, with one fin above the water. The body of the ocean sunfish is scaleless, silvery, and clumsy. This fish seems to consist of one great head with small fins. Ocean sunfish may weigh as much as 1,000 pounds. They are never used as food. The freshwater and marine sunfishes are not closely related. C.L.H.

See also ANIMAL (color plate, Leading Groups in the Animal Kingdom); FISH (Reproduction).

**Classification.** The bluegill is *Lepomis macrochirus*; the pumpkin seed, *L. gibbosus*. These and related species, as well as the black basses, rock bass, crappies, and other fresh-water species make up the family *Centrarchidae*. Ocean sunfish belong to the family *Molidae*. The common species is *Mola mola*.

**SUNFLOWER.** The sunflower is a large flower that belongs to the composite family. It is so named because it has a great, sunlike flower head, with surrounding rays of gorgeous yellow petals.

The annual garden sunflower is one of the best known of several kinds. When cultivated, its flower heads may grow to be a foot in diameter. These heads are flattened discs. The outer circle in each head is a row of large, yellow petals. The other petals are small, tubular flowers which form row after row of circles in the center of the head. The plant has a rough, hairy stem from six to ten feet high, and coarse, heart-shaped leaves. Many leaflike bracts surround the disc, and help to protect the more delicate parts of the flower.

Some of the sunflowers grow year after year, but the garden sunflower must be planted from seed every year. The perennial species are excellent to plant against walls and fences. Sunflowers also are grown for their seeds, which are used as food for cattle and poultry. In some section of Europe, the stalks are used as fuel and the seeds are eaten as nuts.

See also FLOWER (Planting Tid for Annual Flowers; color plate, Prairie Flowers).

**Classification.** Sunflowers belong to the family *Compositae*. The common annual species is *Helianthus annuus*. Among the decorative perennials are *H. argyrea* and *H. decapetalus*.

**SUNFLOWER STATE.** See KANSAS.

**SUN GOD.** See ANOOLU; GOD (Gods of Early Religions); SUN (Superstitions and Myths about the Sun).

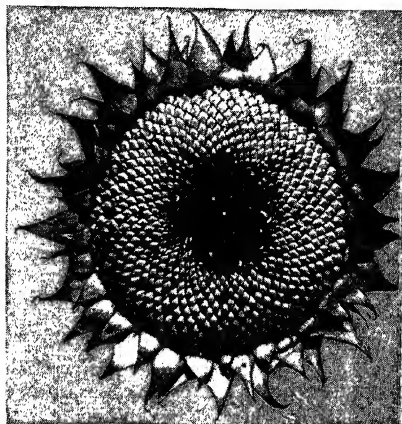
**SUN LAMP** is a common name for a device which gives off artificial ultraviolet radiation. Ultraviolet rays are found in natural sunlight, and they produce a tan on human skin. These rays cannot be seen by the human eye. They are shorter in wave length than the violet light we can see. There are two general types of ultraviolet generators, sun lamps and therapeutic lamps. Sun lamps can be used in the home without the vision of a physician. Therapeutic lamps, professional supervision, to avoid hazards of over-



**The Bold Brilliance of the Sunflower**, along with its huge green leaves and towering height, makes it a popular plant to grow along fences and walls.



**Dew Covers the Petals** of a sunflower not yet in full bloom.



**Seeds of the Sunflower** resemble cobblestones of an Old World street.

The professional therapeutic generator gives off powerful ultraviolet radiation and can produce a sunburn in a period as short as one-half to one minute. The sun lamp is not so powerful. It requires ten to fifteen minutes to produce a light sunburn.

There are several sources of artificial ultraviolet radiation. The carbon arc is a readily available source. Its ultraviolet radiation is made more intense by impregnating the cones of the carbons with certain salts of metals. The mercury arc inside a quartz tube is a common source. Another source looks like an ordinary large incandescent lamp. Inside the special glass bulb is a small mercury arc in a tiny quartz tube. Also inside the bulb is a tungsten filament. The lamp screws into any ordinary socket of 115-volt alternating current power supply. The light from this source resembles the light from an ordinary incandescent lamp, but it is enriched with ultraviolet radiation.

Direct exposure of the skin to ultraviolet rays from the sun or from artificial sources results in the formation of vitamin D. There is no evidence that ultraviolet radiation increases or improves the tone of the tissues of the body as a whole, stimulates metabolism, acts as a tonic, increases mental activity, or tends to prevent colds as many persons believe.

H.A.G.

See also GERMICIDAL LAMP.

**SUN MOTOR.** See SOLAR ENGINE.

**SUNNITE, SOON** *etc.* See ISLAM (SECTS).

**SUNSET CRATER.** See NATIONAL MONUMENT.

**SUNSHINE, or SUNLIGHT.** See BABY (Fresh Air); CHLOROPHYLL; GROWTH (Factors Affecting Human Growth); HELIOTHERAPY; LIGHT; SPECTRUM AND SPECTRUM ANALYSIS; ULTRAVIOLET RAYS.

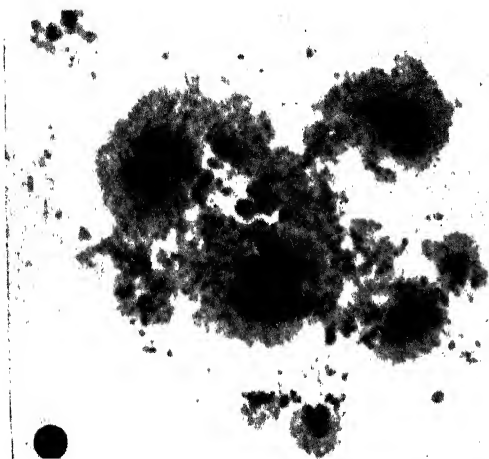
**SUNSHINE STATE.** See NEW MEXICO; SOUTH DAKOTA.

**SUNSPOT.** Sunspots are storms on the sun. When the sun is viewed through a telescope and suitable precautions are taken to protect the eyes from the very intense light, certain details of the disc of the sun can be seen. Sometimes there are dark flecks visible on the sun's fiery surface. These are sunspots.

If we watch sunspots from day to day it at once becomes evident that the sun is rotating, because spots that were near the center of the sun's disc a few days ago are now near the edge, and are foreshortened. Sunspots show that the sun rotates on its axis once in about 26 days. The spots themselves seem to be dish-shaped depressions with raised edges.

Nearly all the radiance of the sun comes from its surface layers. We have no sure way of knowing what might be below. Sunspots act like holes in the flaming surface





Mt. Wilson Observat

**Sun Spots** cover an area of the sun many times greater than the size of the earth, shown in black at the lower left.

of the sun and give us a glimpse of what seems to be a darker interior. The center of a sunspot, called the *umbra*, looks as black as ink in a telescope, while the edges of the spot, called the *penumbra*, look grayish. This blackness of the umbra, however, is more seeming than real. Actually the radiance from the darkest parts of a sunspot is brighter than an arc of light. The sunspot only seems to be dark when compared with the immensely brighter surface of the sun.

Sunspots come and go in cycles of 11.2 or 22.4 years. There are other longer sunspot cycles, too. See CYCLES.

Individual sunspots have little effect on the earth and upon humanity, but sunspot cycles do. The magnetic quality of the earth changes with each sunspot cycle. In time of magnetic storm our radio and telegraph circuits are badly disturbed. The quality of sunlight changes in step with sunspot cycles. In recent years, many scientists have studied the relationship between sunspot cycles and activities on the earth. C.E.

**SUNSTROKE.** Two different ailments result from overheating of the body. One is called *sunstroke* (or *heat stroke*), and the other, *heat exhaustion*.

Sunstroke usually comes on quickly. The victim has a sense of burning heat all over the body. His head aches, he is dizzy, he cannot see clearly, and then he becomes unconscious. His skin becomes burning hot and red and he may have delirium. His temperature is high, ranging from 107 to 110 degrees or more. When such strokes attack persons who have not been in the sun, but have perhaps been shut in hot rooms where the air has become foul, the condition is called *heat stroke* rather than sunstroke.

Treatment is given a victim of sunstroke by cooling the body. Put the person in a cold bath or wrap him in cold wet sheets. Ice may be applied to the head or body, or both. Cold must be applied until the temperature falls to 102 degrees or below and remains there. The use of electric fans is helpful. Water may be given, but no stimulants. It is always wise to call a physician, but if one cannot be found, no time should be lost in getting

the victim's body temperature reduced to a safe level.

**Heat Exhaustion** is the milder of the two ailments. It results from exposure to indoor heat or to the sun's rays on a sultry day. Excessive perspiration (causing loss of body salt) is the direct cause. Dizziness and nausea are common. The pulse becomes feeble and the patient feels exhausted and faint. The skin becomes pale and clammy. The victim may lose consciousness. The temperature will fall below normal, perhaps to 95 degrees. But recovery is usually fairly rapid. The chief remedies are rest and stimulation.

Give the victim fresh air. Treat for shock by keeping the patient warm. If the case is unusually bad, a warm bath may be given. Stimulants such as tea, coffee, or aromatic spirits of ammonia also should be given. A victim of heat exhaustion should be given at least a tablespoonful of salt. It can be given in tablet form or in about a quart of water.

Heat exhaustion can usually be prevented by drinking lots of water with salt. A teaspoonful to a quart of water, or a 15-grain salt tablet with each glassful of water, is recommended. This replaces the salt lost in perspiration.

W.R.LAP.

**SUN WORSHIP** is not found in the simplest cultures but only in those which are relatively advanced. It is little developed, or not present at all, in the hunting and fishing cultures. It attains much importance only among agricultural peoples. In the New World it is important only in the agricultural southeast and southwest United States, and in the high cultures in Mexico, Central America, and the Andean region. In the Old World it was important in the ancient cultures of Egypt, Babylonia, Persia, and North India. But it was never important in the Far East, although the Japanese have believed for centuries that their emperor was directly descended from the sun goddess *Amaterasu*, the sister of the moon god. People worshipped the sun as a god, only when they became aware that it was the source of life as well as of warmth. Ancient Egyptians first identified it with the god *Ra*, or *Re*, and later with *Osiris*, who came to be also the god of the dead and of resurrection. W.D.W.

**SUN YAT-SEN**, *sun yat-sen* (1866-1925), aided the overthrow of the Ch'ing, or Manchun, dynasty in China and the establishment of the Chinese Republic. He founded the Kuomintang, or National People's party, which later took control of the Chinese national government under the leadership of Chiang Kai-shek. Sun was more a dreamer, idealist, and plotter than he was a statesman and practical politician. But he was greatly concerned with the betterment of the Chinese people. The goals which he set forth in his *Sun Yat-sen (The People's Principles)* became the basis of the political reformation of China.

He was born of a peasant family in the Changshan district of Kwangtung Province. He spent some years in Hawaii, but returned to



Brown Bros.

**Sun Yat-sen** founded the Republic of China.

China to study medicine at the University of Hongkong. For a time, he practiced as a doctor in Macao and Yangcheng, but spent most of his time plotting against the Chinese Government. In 1895 he took part in an unsuccessful rebellion and was forced to flee China to avoid arrest.

Sun spent the next sixteen years in the United States, Japan, and Europe. There he worked among the Chinese communities to gain support for his plans to overthrow the Manchu emperors. He was in the United States at the time of the outbreak of the Chinese revolution in October, 1911. He returned to China at the end of December and was elected temporary president of the Chinese republic in 1912. But he was not able to deal successfully with the politicians of his government, and retired after two months in office to give the presidency to Yüan Shih-k'ai. Yüan was a conservative and practical politician who saw the revolution as a chance to gain power for himself. Sun was a dreamer with little practical experience. He soon disagreed with Yüan and tried to overthrow him in 1913. But he was unsuccessful and had to flee to Japan.

In the summer of 1916, Yüan died, and in the next year Sun declared himself head of a South China government with his capital in Canton. There he plotted to take control of all China. He tried to get help from Japan, but was unsuccessful. He finally accepted help from the Soviet Union, which sent him military and political advisers, as well as material help in the form of money and weapons.

But in 1922, the Chinese war lord Chen Chiung-ming drove Sun from Canton. In the next year Sun returned and, during the next year, delivered a series of lectures which contained his earlier announced Three People's Principles. His influence began to increase in the rest of China. On December 31, 1924, he reached Peking (now Peiping) for a conference with other national leaders. There he died the next March.

Sun failed by two years to see the fulfillment of his plans. Chiang Kai-shek followed him as leader of the Kuomintang forces, and in 1927 and 1928 unified most of China under his government. On June 1, 1929, Sun's body was entombed in a beautiful mausoleum outside the city of Nankin. For illustration of the tomb, see NANKING.

**Sun Ching** (1895- ) was Sun Yat-sen's second wife. Sun Ching was the daughter of Charles Jones Soong and the wife of "T. V." Soong Tse-ven, Soong Mei-ling (who married Chiang Kai-shek), and Soong Ai-ling (who married H. H. Kung). She was educated at Wesleyan College, and returned to China to become Sun Yat-sen's secretary. She married him in 1916. In 1926, she joined the left wing group of the Kuomintang government, and fled to the Soviet Union after Chiang Kai-shek broke with this group. She returned to China only for a short period in 1929 to attend her husband's state funeral in Nanking. Until 1938, she refused to associate with Chiang, who, she believed, had not followed Sun Yat-sen's principles. She would not set foot on Chinese soil, but lived in the foreign concession in Shanghai and in Hongkong. Finally, in 1938, she entered China and set up relatively friendly relations with Chiang Kai-shek.

**Sun Fo** (1891- ) is the son of Sun Yat-sen by his first wife, whom he divorced. Sun Fo was educated at the University of California and at Columbia University. Later, he returned to China to take part in his

father's government in Canton. He held a number of important positions in the national government although he was at times critical of Chiang Kai-shek. He became known as a strong enemy of Japan and on occasion an admirer of the Soviet Union.

H. F. MacN.

See also CHIANG KAI-SHEK; CHINA (History); YÜAN SHIH-K'AI.

**SUOMI**, *SWAW* *mih*. See FINLAND.

**SUPERCHARGER**. This accessory for a gasoline engine is usually used to maintain engine efficiency at high altitudes. Every internal combustion engine is designed for maximum efficiency at a certain external air pressure. This is usually the air pressure of sea level, or about fifteen pounds per square inch. All such engines draw in air with each firing cycle, mix it with vaporized fuel, burn the fuel with the air, and discharge the burned gases. A fixed ratio of air to fuel is essential if the engine is to deliver its proper amount of power. If the amount of air passing into the carburetor should be lessened, there will not be enough oxygen to burn the fuel properly. The efficiency of the engine will drop. This happens at high altitudes. With lowered air pressure aloft, an airplane engine with no supercharger can no longer get enough air to deliver its proper power, and there comes a top limit, or ceiling, to the plane's flight. To improve this, superchargers are installed.

A supercharger is a small air pump, generally a very high speed turbopump that feeds compressed air into the carburetor. This enables the engine to operate efficiently in low outside air pressure. An engine with a supercharger can never quite equal the efficiency of the same engine without a supercharger at sea level, because some of the power from the engine must be used to turn the supercharger. Otherwise, a supercharger makes an engine perform satisfactorily at a wide range of high altitudes.

Both Diesel engines and some gasoline engines in automobiles may use a form of the supercharger to increase their efficiency.

E. A. Fe.

**SUPER FORTRESS**. See AIRPLANE (beginning with Airplane Design).

**SUPERHETERODYNE**, *su per HET er oh DYNE*. See ARMSTRONG, EDWIN HOWARD; RADIO (Radio Hookups).

**SUPERHIGHWAY**. Any highway which has four or more traffic lanes, and which is designed to eliminate crossings with other highways and railroad tracks, may be called a superhighway. Some superhighways stretch in nearly a straight line for over sixty miles. Automobile traffic can often travel safely on such roads at speeds from sixty to eighty miles an hour. Direct intersections with other traffic are avoided by underpasses, overpasses, or curving intersections laid out in the shape of a clover leaf.

One of the most famous superhighways in the United States is the Pennsylvania Turnpike, which runs between Harrisburg and Pittsburgh, a distance of 161 miles. This road follows an old railroad route. It was completed in 1940, and later lengthened to reach to Philadelphia. This four-lane superhighway carries traffic which speeds along at seventy-five to eighty miles an hour. Motorists can drive the entire distance without stopping, without shifting gears, and without meeting any of the usual highway interferences.

See also ROADS AND STREETS (list of Related Subjects).

**SUPERIOR**, Wis. (population 35,136). This important Lake Superior port, opposite Duluth, Minn., is the home of the largest ore docks and the largest grain elevator in the world. The elevator can hold 12,000,000 bushels of grain. The docks can store 440,000 tons of ore. One of the largest farmers' grain co-operatives in the United States does more than \$3,000,000 worth of business a year in Superior. Shipbuilding is an important industry of the city. Superior is the home of a state teachers college. Fur traders camped on the site of the city in 1662. For many years this region was a center for missionary groups. E.G.D.

**SUPERIOR, LAKE**, is the largest body of fresh water in the world. It is the deepest, highest above sea level, and farthest northwest of the five Great Lakes of North America. Lake Superior is an important link in the great waterway system that extends east through the United States to the Atlantic Ocean, and south, through the Mississippi River, to the Gulf of Mexico.

French fur traders named this huge body of water *Lac Supérieur*, which means *Upper Lake*, to distinguish it from Lake Ontario. English settlers of the region later took over the name without translating it. They thought the French called it Superior because the lake was so large.

#### General Description

**Location.** Lake Superior lies on both sides of the International Boundary between the United States and Canada. The Canadian province of Ontario is on the



**Location Map of Lake Superior.** The small corner map shows the location of Superior in regard to the other Great Lakes.

north and east. Wisconsin and Michigan lie south of the lake, and Minnesota touches the western shore.

**Size.** The greatest length of Lake Superior from east to west is 412 miles. The greatest width is 167 miles. The total area of Lake Superior, 31,820 square miles, is more than that of South Carolina. The greatest depth of Lake Superior is 1,290 feet. Most of the lake lies 602 feet above sea level.

**Surface Features.** The coast line of Lake Superior is bold and rocky. In some places, especially on the northern shores, there are steep cliffs which rise straight up several hundred feet from the water's edge. The Michigan shore has colorful sandstone walls known as the Pictured Rocks. The waters of the lake are unusually pure, and contain many whitefish, sturgeon, and trout. These fish are caught and sold in the markets of nearby cities.

About two hundred rivers empty their waters into Lake Superior. The largest of these rivers is the Saint Louis, the extreme headwater of the Saint Lawrence

River. The mouth of the St. Louis is at the western end of the lake. There are many islands in the lake. The largest are Isle Royale, which is a part of Michigan, and the Canadian islands of Saint Ignace, and Michipicoten. Numerous islands, known as the Apostle Islands, lie off the northern shore of Wisconsin.

#### Commerce

Lake Superior is open the year around. The lake never freezes over because it is so deep, but ice forms along the borders and in the bays. However, navigation is restricted to the period from mid-April, when the ice in the harbors melts, to the first of December, for after the latter date there are serious storms. Ship routes cross Superior in all directions, since the land around the lake is a region rich in copper, iron, nickel, and other metal ores, and is accessible to the grain lands of the West. These heavy ores and grains are most easily and cheaply shipped by lake boats, and the main routes are from the west end of the lake, at Duluth and Superior, to the Soo Canals.

Navigation from Duluth to the Atlantic Ocean has been made possible by the locks of the Sault Sainte Marie Canals. These locks were built around a series of rapids at the point where Lake Superior pours its waters into Lake Huron by way of the Saint Marys River.

**Ports.** Important ports on the shores of Lake Superior besides Duluth include Marquette, Mich.; Superior and Ashland, Wis.; and Fort William and Port Arthur, Canada. I.D., Jr.

See also GREAT LAKES; SAULT SAINTE MARIE CANALS.

**SUPERLATIVE**, *see* *PUR* lah tiv. See COMPARISON.

**SUPERMAN, THE.** See NIETZSCHE, FRIEDRICH WILHELM.

**SUPERNATURALISM**, in religion, is the belief that there is a power above the natural. It is based on man's instinct to look for cure and direction to a force higher than himself. The Greek poet Homer expressed this when he said that all men need the gods, as young birds need to open their mouths for food.

An example of modern supernaturalism is the acceptance of the miracles of the Bible. Its opposite is *rationalism*. See also RATIONALISM. W.D.W.

**SUPERPOSED, or SUPERIMPOSED, ORDER.** See ARCHITECTURE (TERMS).

**SUPERREGENERATION**, *see* *per* see JEN n A shun. See ARMSTRONG, EDWIN HOWARD.

**SUPERSONIC**, *see* *per* SILLY ik. **DETECTOR.** See DETECTOR, SUPERSONIC.

**SUPERSTITION**, *see* *per* STISH un. Man has learned very slowly to understand the world about him. For many thousands of years, strange or mysterious events or circumstances troubled or frightened him. He believed they were caused by good or evil forces, which could be controlled if he had the power to do so. These beliefs, now no longer held, are called *superstitions*. The word means *that which stands above, or survives*.

Present-day science believes that everything in nature has a natural cause, and a knowledge of nature's laws helps to explain every cause and effect. Scientific men arrive at this conviction through observation and reason. Scientific thinking helps to destroy the belief in superstition.

All peoples use the scientific method to some extent. But many superstitious notions and customs persist. Some of these are odd or amusing, and many of them are harmless. Even at best such superstitions show an uncritical attitude of mind, and some of them are harmful.

### Forms of Superstition

Many superstitious customs come from ancient times. A common source of superstition arises from a real or fancied resemblance between objects, persons, or events. The resemblance suggests a relationship between things which are similar. One is believed to influence the other. The apparent increase in the size of the moon, from new moon to full moon, is believed to influence favorably the growth of plants. Such superstitions are called *sympathetic magic*.

Many superstitions utilize charms and spells, call on good or evil spirits, foretell the future, or give magic powers to certain forces or objects.

**Sympathetic Magic.** There is a wide-spread conviction that nature affects human conduct in mystic ways, in addition to the obvious physical effects of heat, cold, storm, and other conditions and forces. The belief that occupational or ceremonial movements must correspond to movements in nature is widespread. For example, circular religious processions follow the direction of the sun, from east to south, west, and north, in a clockwise direction. In rural districts of North Europe, batter is stirred in this direction. If the direction is reversed, bad luck will follow, or the batter will be spoiled, according to superstition. The reversal of the usual procedure is supposed to bring bad luck.

**The Left Side.** The use of the right hand is normal for most persons. For this reason, the substitution of the left hand is forbidden, because it offsets the good. A reference to the left shoulder is supposed to reverse the meaning or the results of a falsehood. The literal meaning of the word *sinister* is *left*. The later and present meaning of threatening or evil is due to untoward associations with the left hand.

The *untowardness* of the left gives it a magic quality. The left hind foot of a rabbit becomes a charm. One must see the new moon for the first time over the left shoulder, and turn the silver in one's pocket, to have good luck. Often a superstition spreads out in many directions.

**Astrology.** Men observe the changes and the courses of sun, moon, stars, and planets. Their positions are believed to influence human life. The knowledge gained by studying the heavens developed into an elaborate system of foretelling the future, a pseudo, or false, science, known as *astrology*. Babylonians gave the planets the names of gods or goddesses. A person born under the planet Mars would have a violent disposition like that of Mars, the god of war.

Astrology became a very complex form of superstition. But the careful study of the heavens which it fostered led to the true science of *astronomy*.

**Evil Magic.** Magic is commonly used for working evil, casting a spell, or bewitching. An evildoer makes an image of the victim in wax or clay. Then he burns, buries, or pierces it with thorns or pins. Thus he and others believe that he injures the victim and causes his

death. This is a common belief of the followers of the voodoo magic of Africa.

**Protection by Charms.** Misfortunes were commonly believed to be the result of evil influences. Objects credited with power to protect one against these harmful forces or beings are called *charms*. A charm may be a formula, a piece of metal, a stone, or some other object which is believed to bring luck. Charms are common to this day, especially among those who are in constant danger. Belief in their protective power is not limited to persons who have little or no education.

**The Evil Eye.** Belief that evil can be transmitted by the eyes of certain people is an ancient and now widespread superstition. It exists in Europe, especially in Italy, and throughout the Moslem world. Many kinds of charms are used to counteract the effect of the evil eye. Moslems believe that the five fingers of the hand, or any design or phrase associated with the number five, will protect against it. Another powerful charm is an image or design of an eye, which is supposed to throw back the evil to its source.

**Evil Spirits.** Some charms keep away evil spirits. A horseshoe nailed over a door has this virtue. The horseshoe is now a symbol of good luck. Many superstitions have gathered about it. In some places, one who finds a horseshoe must return at once to his house, without speaking to anyone, and hang it over the door, prongs up. If hung prongs down, the luck will fall out. It must be fastened with three nails, each driven in by three blows of the hammer. Belief in the mystic power of three probably comes from the Trinity of God the Father, God the Son, and God the Holy Ghost. The origin of the superstitions regarding the horseshoe is not known. It appears to have started in comparatively recent times.

**Names and Words.** Primitive peoples regard the name as an intimate part of the person. One's actual name is sometimes kept secret, since by means of it another person might bewitch the owner. In some tribes a child may not be given the name of a living relative, for fear the relative would die. There are holy names, particularly the name of the deity, which may not be spoken. Magic words when uttered summon spirits, protect against danger, or give power to medicine or to ceremonies. *Abacadabra* was at first uttered to ward off disease. But now it is a synonym for silly, empty, or meaningless words. *Open Sesame* were the magic words which opened the door to the den of the thieves in the *Arabian Nights'* tale of "Ali Baba and the Forty Thieves."

The belief that the mention of misfortune or evil will bring misfortune on one is another form of belief in the power in words. This idea is found in the common superstition of touching wood after making a statement. Some scholars believe this is a substitution for an earlier custom of making the sign of the cross. For example, a traveler states that he has never been in a railway accident. To prevent this misfortune in the future, he touches wood. Under similar circumstances Germans say "Unberufen" (*uncalled for*), and Moslems, "Bismillah" (*in the name of God*).

**Belief in Spirits.** In all parts of the world men believe in spirits. Some, especially fairies, elves, and sprites, are helpful to human beings. Gnomes and goblins are full of mischief. For example, they cause milk to sour.

Spirits dwell in trees, rocks, springs, caves, rivers, or underground. Belief in spirits or spiritual existence is called *animism*. Evil spirits cause disease, and the spread of disease is often credited to spirits.

*Driving evil spirits out of the body* is called *exorcism*. Exorcism combines the functions of priest and physician. The exorcist drives or frightens the spirit out of the body of the patient. To accomplish this purpose, primitive people beat drums, shake rattles, dance, sing, pray, or perform a ceremony. Exorcism is still practised by some Christian religions to cure disease, or to rid a house of ghosts, rats, lice, or plague.

*Possession* by a spirit was a common explanation if a person lost consciousness, foamed at the mouth, or raved. The term *epilepsy*, which means *taking on*, refers to possession by a spirit.

*Sneezing* is almost everywhere an omen. Some believe that in a sneeze a spirit leaves the body. Italians, to turn it into a good omen, say, "*Felicità*" (*blessing, or good luck*). Germans say, "*Gesundheit*" (*your health*). Sometimes English-speaking people say, "God bless you," when someone sneezes.

*Pictures*. A picture or a reflection of a person is believed to possess part of his spirit, or to be his spirit or soul. This belief led to the practice of covering mirrors at time of death, or on certain other occasions. It is responsible for the superstition that breaking a mirror brings bad luck. Primitive people often object to having their picture taken. They are afraid they may part with a portion of themselves, or that they will be bewitched by means of the picture.

*Dreams*. A dream is regarded as an experience in which the soul of the sleeper leaves the body. For this reason, one should not waken a sleeper suddenly. His soul might not find its way back to the body. There is also belief in the return of the spirit, or ghost, of the dead to its former haunts. This idea has played a large part in superstition. It has led to trying to please dead ancestors, to the belief that the spirit of an ancestor returns in a newborn child, and to some modern cults, for example, spiritualism. Sometimes a child is named after the ancestor whose returned soul has been recognized.

*Jinn*. Moslems believe in spirits called *jinn*, who were created before man existed. The *jinn* live underground or in the sea, but often come to the upper world. They sometimes take the forms of cats, dogs, or other creatures. Sometimes they have human form. Most *jinn* are evil. They cause storms, whirlwinds, shipwrecks, disease, and a variety of misfortunes. There are also good *jinn*, who sometimes help men. Aladdin, in the tales of the *Arabian Nights*, summoned a *jinni* by rubbing a magic lamp. Each house has its *jinn* owners in addition to the human owners. The threshold is a favorite spot of the *jinn*. A bride is carried over the threshold, for fear a *jinni* might be sitting there. Protection against these beings is secured by various means. Recitation of passages from the Moslem holy book, the *Koran*, is considered particularly effective.

**Salt**. Salt is widely regarded as possessing magic qualities. Its power to check decay may be partly responsible for the superstitions connected with it. It is believed to ward off many kinds of spirits, including *jinn*. The European custom of throwing a pinch of salt over the

shoulder is a means of keeping the devil at a distance. If salt is spilled, this signifies that there will be a quarrel. Offering salt to a guest indicates a spirit of friendly hospitality.

**Medical Superstitions**. Many folk treatments are based on a likeness between the thing prescribed as medicine and the afflicted part of the body. For example, walnuts are supposed to be good for diseases of the brain. The kernel has the form of the brain, and the shell resembles a skull. The Chinese physician administers the tops, middle portions, and roots of plants for diseases of head, chest, and legs, respectively.

Sometimes the weapon which inflicts a wound is treated. The wound is healed by applying salve to the weapon. The phrase "to take a hair of the dog that bit you" reflects the same notion that one can cure the bite by means of a hair from the biter.

The fact that a magnet attracts particles of iron has led to the belief that it will also draw rheumatism out of the body. Magnets were once very rare, and were believed to possess magic powers. European peasants carried them to avoid or to cure disease. They also wear about the neck or carry a bag of the bad-smelling plant substance called *asafoetida*, to ward off disease. This custom was even rather common during the 1918 influenza epidemic in the United States.

Belief that unusual objects have powerful medical effects led to the practice of brewing repulsive mixtures as medicines. An example is the witches' brew described in Shakespeare's *Macbeth*.

Astrology was early associated with medicine and the theory of disease. An example is the belief that the moon causes insanity. The term *lunatic*, which comes from *luna*, the Latin word for moon, comes from this notion. Each part of the body was associated with certain heavenly bodies. Medical treatment was given only when the associated heavenly bodies were in favorable position.

Patients who believed strongly enough in such superstitious medical practices sometimes improved. Perhaps an induced optimistic mental state assisted in recovery.

**Present-Day Superstitious Ideas and Practices**. The tendency to cling to superstitious beliefs is strong among people who have little or no education, although many educated people also are superstitious. They may not believe fully in their superstitions, but they conform with them because of a feeling that possibly it is safer to do so.

Many common superstitions which in themselves are fairly innocent interfere little with otherwise reasonable thought or behavior. But they sometimes influence conduct.

Hotel rooms, steamship cabins, and city houses sometimes skip the number thirteen, because many persons believe it is unlucky. Friday is also thought to be rather unlucky, and a Friday which falls on the thirteenth day of the month is especially unlucky.

Bubbles in a teacup, or an itching skin, are supposed to foretell visitors.

A blister on the tongue means that one has told a lie. If four people cross one another's hands when they shake hands, there will be a wedding. If your ears burn, someone is talking about you. Cold shivers in-



## SOME COMMON SUPERSTITIONS

Many look at the new moon  
over their left shoulders



Many believe a wish made  
on a falling star comes true

CALENDAR

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

dicare that someone is walking over the spot that will be your grave. If you step on a crack, you will fail in your lessons. The gift of a knife cuts friendship. Bad luck follows if one breaks a mirror, walks under a ladder, postpones a wedding, or opens an umbrella indoors. It is unlucky to turn back from a journey, to stub the toe, to wear clothes inside out, to wear a peacock feather, to meet a black cat or a funeral procession, to leave a house through a window, or to sit on a table. Good luck is betokened if one finds a four-leaved clover or a horseshoe, picks up a pin, or returns money in payment of a debt.

**Foretelling the Future.** Some superstitious practices are less innocent. Especially so are those by which fortunetellers and other fakes claim to predict future events, read character, or communicate with the dead. Belief in fortunetelling is very old. The ancient Romans and Greeks had their oracles and augurs. The French believed in the prophecies of Nostradamus, and the English followed Mother Shipton. Nowadays, persons in all walks of life are relieved of hundreds of thousands of dollars each year by fortunetellers. Fortunetelling is often harmful to the one whose fortune is told. But to many persons it is merely a form of entertainment, and they place no faith in it. Many businessmen, however, as well as men and women of all classes, consult fortunetellers for advice regarding business, love affairs, and various contemplated enterprises.

Some fortunetellers claim to possess special powers which enable them to foretell the future. Some rely on various systems of divination which are supposed to reveal a person's characteristics or proclaim his fate. Fortunetelling by cards is an example of this method. The lines in the palm of the hand are supposed to indicate personal characteristics, abilities, or fate. This method of divining is called *palmistry*. Tea-leaf reading, crystal gazing, astrology, and taking omens from dreams are other forms of these pseudo sciences.

Many persons persist in clinging to superstitious beliefs because they hope that influences which lie outside the scientific realm affect human life and destiny. Some persons who in the main think logically, cling doggedly to certain scientifically discarded beliefs. Their scientific thinking is only partially developed. There is no proper place for such attitudes in our present advanced state of knowledge. But superstition always has existed, and probably will exist as long as human beings inhabit the earth. Error seems to persist as strongly as truth.

W.D.W.

**Related Subjects.** The reader is also referred to:

Almanac	Blarney Stone	Palmistry
Aquamarine	Fetish	Pioneer Life
Astrology	Fortunetelling	(Superstitions)
Augur	Genii	Voodoo
Beryl	Ghost	Witchcraft
Birthstone	Occult	

**SUPERSTRUCTURE.** See BUILDING CONSTRUCTION.

**SUPINATOR,** *see pih NA ter*. See ARM.

**SUPPLY AND DEMAND.** In economics, the term *supply* means the quantity of goods that will be offered for sale at various prices in a given market. The term *demand* refers to the quantity of goods that will be purchased at various prices. In a free market, the price of

a commodity is determined by the relation between the supply of the commodity and the demand for it. If the supply is great, as compared with the demand, the price will be low. If the supply is small, as compared with the demand, the price will be high. For a more detailed discussion of this principle of supply and demand, see also INFLATION AND DEFLATION; PRICE; VALUE (Supply and Demand).

H.G.M.

**SUPRARENAL,** *see prah RE nal*, **GLAND.** See GLAND (Adrenal Glands).

**SUPREME COUNCIL OF ROYAL ARCANUM.** See ROYAL ARCANUM, SUPREME COUNCIL OF.

**SUPREME COURT OF CANADA.** See CANADA, GOVERNMENT OF (Judicial).

**SUPREME COURT OF THE UNITED STATES.** The Constitution set up careful rules for the organization of the executive and legislative branches of the government. In regard to the judicial branch, it said simply:

The judicial power of the United States shall be vested in one Supreme Court, and in such inferior courts as the Congress may from time to time ordain and establish.

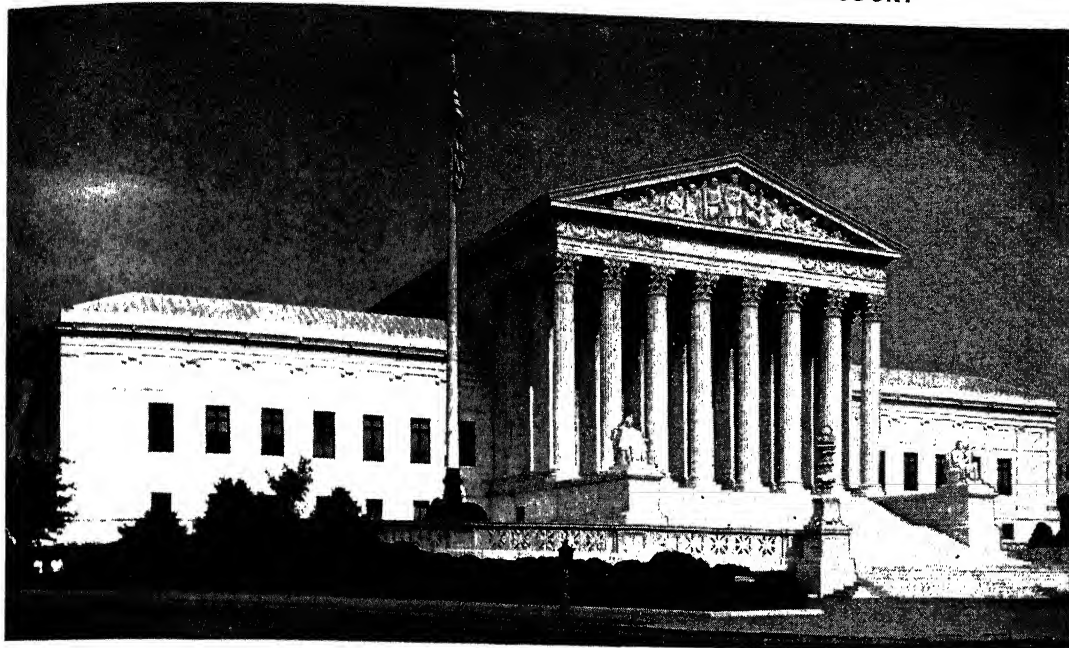
The Constitution gives to the President the power to appoint judges to the Supreme Court. It says also that judges shall hold office during their good behavior, and that no judge shall have his pay cut. But it does not list the powers of the Court, or lay down qualifications for the justices. It does not even say how many members the Court should have, or how the number should be determined.

Government authorities have taken for granted that the men who wrote the Constitution expected Congress to "ordain and establish" the Supreme Court as well as the lesser courts. An act of Congress established the Supreme Court in 1789.

**Organization and Membership.** The Supreme Court now consists of a Chief Justice and eight Associate Justices. This has not always been true. The first Supreme Court had six members. This was according to the First Judiciary Act, passed by Congress in 1789, which provided that the Supreme Court should consist of a Chief Justice and five Associate Justices. The number was increased to nine in 1837, and to ten in 1863. In 1866 Congress was so bitter against President Andrew Johnson that it did not want him to have the privilege of making any appointments to the Court. Two vacancies occurred in the Court, but Congress simply passed a law which reduced the number of associate justices to seven. In 1869 the Court was again enlarged, and it has consisted of nine members ever since.

Members of the Supreme Court are not required to have had any experience either as judges or as lawyers. Any citizen can hold the post if the President appoints him and the Senate approves the appointment. In practice, nearly all appointees have had legal training and experience.

**Sessions of the Court.** Sessions of the Supreme Court are held each year from October to May in the stately Supreme Court Building in Washington. All the justices usually attend, but a case may be heard if as many as six are present. Cases are decided by a majority vote. If the Court is evenly divided, the case must be heard again.



The Supreme Court Building in Washington, D.C., is a glittering white marble structure designed by Cass Gilbert and completed in 1935. At the entrance are two symbolic statues

carved by James Fraser. The statue on the left portrays thought on the problems of justice, and the statue on the right typifies strong enforcement of the law.

Weinstein, Pix

Cases in the Supreme Court must be argued by attorneys specially licensed to plead before that body. Before an attorney can be admitted to practice before the Supreme Court, another attorney, already admitted, must present the name of the new attorney to the court at the opening session. The attorney who is already admitted requests that his brother attorney be allowed to practice before the Court. If the Court grants the request, a license is issued and sent to the applicant. Many such licenses are issued at the opening of every Supreme Court term.

After listening to a case, the justices discuss it in secret session in the conference room. The vote on the decision is taken by the call of the Chief Justice, who then assigns one of the justices to prepare the *opinion*, or formal statement of the reasons for the decision. Any other justice may, if he desires, write a *concurring* opinion. If he disagrees with the decision, he may write a *dissenting* opinion. The opinion in every case, together with any concurring or dissenting opinions, is read in a public session of the Court and published in the *United States Reports*.

Each of the nine justices is assigned to one or two of the ten judicial circuits into which the country is divided. (See CIRCUIT COURT OF APPEALS.) In early years, the justices of the Supreme Court used to travel "on circuit," hearing cases at various places.

**Jurisdiction of the Supreme Court.** The Court's authority or jurisdiction is defined in the Constitution. Cases come before the Supreme Court in two ways. A few may be commenced in this high tribunal, and in these cases the Court is said to have *original* jurisdiction. The original jurisdiction of the Supreme Court is limited to cases affecting ambassadors, public ministers, and consuls,

and those in which one of the various states is a party.

In all other cases, the Court has *appellate* jurisdiction. This means that most of the cases heard by the Court come on appeal from the lower Federal courts or from the highest courts in the various states. Appeals from state courts may be taken only when a Federal or a constitutional question is involved.

**Judicial Review.** The power which gives unique distinction to the Supreme Court is its authority to render final decision upon the constitutionality of acts of Congress and state legislatures. In this capacity the Court acts as the guardian of the Constitution, upholding the supremacy of the national laws and preserving the rights of the individuals and the states.

The authority to examine the constitutionality of acts of Congress is not specifically granted in the Constitution. In 1803, in the case of *Marbury v. Madison*, the Court asserted this right and has never ceased to exercise it. See JEFFERSON, THOMAS (Administrations as President [New Policies]).

The power of the Court to review acts of Congress rests on the following theory:

The courts are established by the Constitution in order to interpret the law.

The Constitution is the supreme law of the land, and statutes, whether acts of the national or of the state legislatures, are inferior to it.

Accordingly, where the courts find any clause in a statute to be in conflict with the Constitution they are compelled to pronounce such statute null and void. Judicial review involves interpretation of the Constitution, and thus Chief Justice Hughes was literally correct when he said: "We are under a Constitution but the Constitution is what the judges say it is."

**Salary of Justices.** The Chief Justice receives a salary



William O. Douglas



Felix Frankfurter



Chief Justice  
Frederick M. Vinson  
and the  
Eight Associate Justices  
of the Supreme Court



Frank Murphy



Hugo L. Black



Stanley F. Reed



Wiley B. Rutledge



Harold H. Burton



JOSEPH HARRIS & EDWIG: ACME

Robert H. Jackson

of \$20,500, and the Associate Justices \$20,000. A justice who has reached the age of seventy and who has served ten years is entitled to retire on a pension equal to his salary if he so desires.

**The Chief Justice.** Twelve men have presided as Chief Justice. The outstanding jurist among this number is John Marshall, who served from 1801 until his death in 1835. His logical opinions established precedents which have guided the Court for years. Above all, he set the standard for a broad interpretation of the Constitution. For these reasons he has been called "the second Father of the Constitution." William Howard Taft is the only former President who has served as Chief Justice. Following is a complete list of Chief Justices:

**John Jay**, of New York. Appointed in 1789 by President George Washington, resigned in 1795 to become governor of New York.

**John Rutledge**, of South Carolina. Appointed in 1795 by President Washington. He presided over one term of the court, but the Senate refused to confirm his appointment in December of that year.

**Oliver Ellsworth**, of Connecticut. Appointed in 1796 by President Washington, resigned in 1799. William Cushing of Massachusetts was appointed in 1796, but declined the honor.

**John Marshall**, of Virginia. Appointed in 1801 by President John Adams, and served until 1835.

**Roger B. Taney**, of Maryland. Appointed in 1836 by President Andrew Jackson, and served until his death in 1864.

**Salmon P. Chase**, of Ohio. Appointed in 1864 by President Abraham Lincoln, and served until his death in 1873.

**Morrison R. Waite**, of Ohio. Appointed in 1874 by President Ulysses S. Grant, and served until his death in 1888.

**Melville W. Fuller**, of Illinois. Appointed in 1888 by President Grover Cleveland, and served until his death in 1910.

**Edward D. White**, of Louisiana, former Associate Justice. Appointed in December, 1910, by President William Howard Taft, and served until his death in 1921.

**William Howard Taft**, former President. Appointed in 1921 by President Warren G. Harding. He resigned February 3, 1930, and died March 8 of that year.

**Charles Evans Hughes**, former Associate Justice. Appointed in 1930 by President Herbert Hoover, and retired in 1941.

**Harlan Fiske Stone**, former Associate Justice. Appointed in 1941 by President Franklin D. Roosevelt, and served until his death in 1946.

**Frederick M. Vinson**, appointed in 1946 by President Harry S. Truman.

G.E.M.

See also ADDRESS, FORM OF; COURT; JUSTICE, DEPARTMENT OF; UNITED STATES CONSTITUTION; and articles on the chief justices listed above.

**SURAJAH DOWLAH**, *son RAH jah DOU lah*, or **SIRAJ-UD-DAULA**, *see RAH jah and DOU lah* (17282-1757). See BLACK HOLE OF CALCUTTA.

**SURAT**. See INDIA (Cities).

**SURCOAT**. See DRESS (Dress in Feudal and Gothic

**SURETY BOND**. See

**SURFACE MEASURE**. See SQUARE MEASURE.

**SURFACE TENSION** is the tendency of any liquid to pull in its open surface so that the surface is as small as possible. It causes liquid to form in spherical drops, since the sphere has the smallest surface as compared with volume. Surface tension varies with the cohesive power of the liquid. That is, the liquid whose molecules have the strongest attraction for each other has the

greatest surface tension. The molecules *near* the surface pull on those which are *on* the surface. This results in a closer concentration of molecules at the surface, which acts like a skin. For example, if the molecules on the surface water are not separated, a needle, or a razor blade can be floated on the surface of the water. Surface tension also helps a soap bubble to hold its shape. The flotation process of separating metals from their ores depends on the property of surface tension.

E.A.FE.



Press Syndicate

**Soap Bubbles Are Round** because the surface tension of soapy water shapes the bubble so that it takes up the least space.

**SURGEON.** See MEDICINE (Vocational Opportunities); SURGERY; also list in the BIOGRAPHY section of the READING AND STUDY GUIDE.

**SURGEON BIRD.** See JACANA.

**SURGEONFISH.** See DOCTORESHIL.

**SURGEON GENERAL.** See BOARD OF HEALTH.

**SURGEONS, AMERICAN COLLEGE OF,** is an organization of surgeons of the United States and Canada. Its chief purposes are to advance the science of surgery and to carry on medical research. Its members are specialists in surgery or related fields. They must meet very high personal and professional standards. The organization holds meetings each year, at which research papers are read. Publications include a journal called *Surgery, Gynecology, and Obstetrics*. The College was founded in 1913 in Washington, D.C. It now has about 13,500 international headquarters in Chicago.

**SURGERY** is perhaps the most dramatic of all the branches of medicine. The skilled fingers of the surgeon seem to perform miracles. Surgery as we know it today is a development of the last hundred years. To our ancestors, surgery meant great pain, often leading to death.

We may best see what is involved in modern surgery

by considering the case of a typical appendicitis operation. First of all, the physician has diagnosed the disease as an infected appendix. The patient is brought to the hospital and prepared for the operation. Sometimes he may be given an injection of a sedative drug before being taken to the operating room. The area on the body which will be operated upon is carefully cleaned. The surgeon and nurses in the operating room spend a long time washing up in order to remove all danger of germs. They put on gloves and outer clothing that have been sterilized. Masks cover their faces to keep germs from being carried on their breath. All the instruments used in the operation have been sterilized. The operation is usually performed on a movable table called an operating table. A trained anesthetist places a mask over the patient's face and opens the valves of a complicated machine, thus allowing the patient to breathe an anesthetic gas; he soon becomes unconscious and insensitive to pain.

Appendicitis is a frequent disease for which an emergency operation is usually necessary. The doctor begins such an operation by making an incision in the skin of the abdomen. This incision is extended through the subcutaneous fat and the muscles are retracted. Bleeding from cut blood vessels is controlled by application of tiny clamps. Sponges, which are actually pieces of gauze folded into large pads, are used to remove the surplus blood. If the case is merely that of an ordinary appendicitis operation, the surgeon quickly removes the appendix, ties the stump, and inverts it into the large intestine. The sponges, which are all marked with metal tags, are removed from the opening in the body. The clamps are removed from the blood vessels and the vessels tied. The muscles are allowed to move back into their normal position. Finally the cut edges of the skin are sewed together.

During the course of the operation, the anesthetist has been taking care that exactly the right amount of anesthetic is being given the patient. One nurse may be standing by with equipment for providing a blood or plasma transfusion if it is needed. The various nurses assist the doctor like members of a well-drilled football team responding to the quarterback's signals.

At the end of the operation the patient is wheeled back to his hospital bed. His recovery is usually uneventful. Yet such a routine operation would have been impossible a hundred years ago.

**Anesthesia.** Before the discovery of anesthesia in 1842, operations were very painful. Because of this pain only very short operations could be performed although surgeons tried to decrease the pain by giving large quantities of wine or other alcoholic beverages. Sometimes compounds containing opium were used.

Today, such anesthetics as nitrous oxide or laughing gas, ether, cyclopropane, and ethylene are widely used, and are very effective. In addition, the surgeon is able to produce anesthesia by injection of drugs such as sodium pentothal into the vein, or by injecting drugs such as procaine into the skin or spinal canal.

**Antiseptics.** The next great step in surgery came with the development of antiseptics by Lord Joseph Lister, who began his important work in 1865. Lister kept out infection by using various antiseptics to kill the germs in



the operating room. More recently the method of *aseptic* surgery has been developed, in which the emphasis is placed on keeping out infection by cleaning and sterilizing all the equipment used in the operating room beforehand. Lister relied upon the use of antiseptics during the course of the operation. In his early methods, for example, he often sprayed carbolic acid about the operating room to kill germs. Modern methods consist of sterilizing all instruments, linens, and so forth, used in the operation. Doctors and nurses taking part in the operation wear sterile rubber gloves because the skin cannot be made sufficiently sterile even with strong antiseptics.

**Instruments.** Another great advance in the growth of surgery has been the development of improved instruments. Of all these instruments, the most useful to the surgeon has been the X ray, which has permitted him to see inside the human body. By this means, the surgeon is able to detect broken bones, and may even diagnose ailments of the stomach and other organs.

Another type of instrument has been useful in looking directly into the cavities of the human body. The *bronchoscope* is used to examine the lungs, and may be connected with forceps and other instruments which permit operations inside the lungs. The *cystoscope* is used to examine the bladder and operate on it. The knives and scalpels used by the surgeon have received an aid in the form of the radio knife, which uses very short radio waves in cutting the tissues of the body.

**Technique.** In 1874 a leading British surgeon spoke of "those portions of the human frame that will ever remain sacred." He said that "the abdomen, the chest, and the brain would be forever shut from the intrusion of the wise and humane surgeon." Since that time, the surgeon has been able to operate successfully upon all parts of the human body including these.

In the abdomen, for example, the surgeon can remove several feet of diseased intestine and sew the remaining intestinal ends together, and the body will function normally afterward. A kidney or even a major part of the stomach may be removed by an operation. The surgeon has been able to operate successfully on the heart. The hearts of living human beings have been lifted from their bodies while they were on the operating table, operated on, and then replaced. Extensive surgery on the lungs and ribs is often part of the treatment of tuberculosis. A surgeon can successfully remove an entire lung that has been diseased by cancer.

Operations on the brain have been successfully performed. Brain tumors have been removed. An operation called prefrontal lobotomy, in which part of the cerebral hemispheres are severed in their connection with the remainder of the brain, has been successfully used in treating mental diseases.

**Specialties.** Various specialties have developed inside the field of surgery. *Ophthalmology*, which is a specialty treating diseases of the eye, has been developed into a distinct field of surgery of its own. Blindness due to cataracts (cloudiness of the lens) can be cured by removing the lens. A common condition known as *cross-eyes* can be corrected by operation on the muscles of the eye. *Orthopedic* surgery is used to correct deformities or diseases of the limbs, particularly the bones. Such sur-

gery is often valuable in treating victims of infantile paralysis.

*Plastic* surgery can effect miraculous results by removing scars and blemishes. Skin grafting is very important in this specialty. World War II gave great impetus to the development of plastic surgery. Men who were seriously disfigured in battle had their deformities corrected by means of surgery. A new nose or new ear now can be made even though the original one was completely destroyed. New jaws can be built out of living bone and cartilage and flesh.

Special surgery devoted to the diseases of women has also developed tremendously. The Caesarean section in childbirth, for example, once killed about 86 per cent of the women on whom it was performed. In some hospitals fewer than two women out of every hundred die after such an operation. Similar progress has been made in the surgery of the ear, nose, and throat.

In the early days of surgery, the most important factor was the operator's technique. Before anesthetics and antiseptics, the skilled surgeon was the man who could perform the operation in the least possible time. Amputations, for example, were performed in two or three minutes by the most skilled surgeons. Now, however, the stress is more and more upon adequate diagnosis of the disease. This is based not only upon the knowledge of surgery itself, but also upon a wide knowledge of physiology, chemistry, and pathology. Technique is still important, however, in many fields of surgery. Brain surgeons must develop skilled ways of operating upon the delicate tissues of the brain.

### History

Surgery has been known since ancient times. The first surgeon's tool was probably a piece of flint stone. Some skeletons of Stone Age men indicate that the operation called trepanning, in which a hole was cut in the head of the patient to relieve pressure from a fracture, was performed, often successfully. But such holes in skulls may indicate merely a primitive belief that "evil spirits" could be let out by carving a hole in the head of an insane person. Primitive tribes had developed ways of treating broken legs by the use of splints. Cauteries, usually red-hot pieces of metal, have been used since earliest times in treating wounds. Circumcision, connected with religious rites, is among the earliest surgical operations.

Some surgical operations were known to the ancient Babylonians, Greeks, and Romans. Military surgery has probably been of some importance for two or three thousand years. The early Hindus were expert surgeons, and were acquainted with at least 125 different surgical instruments. The Hindus developed means of plastic surgery to replace noses and ears that had been cut off. In the Middle Ages the surgeons were often connected with the barbers. Both of them performed the operation of bloodletting, from which arose the red and white striped pole of the barbers, the white standing for the bandage, the red for the blood let in bloodletting.

Among the many famous surgeons was the Frenchman, Ambroise Paré, who lived in the 1500's. He discontinued the harmful process of pouring boiling oil on wounds in order to sterilize them. John Hunter, who

lived in the 1700's in England, was the great founder of experimental surgery. Ephraim McDowell, of Kentucky, performed the first successful operation to remove an ovarian tumor in 1809. Crawford Long, of Georgia, is credited with the discovery of the use of ether anesthesia in 1842. Among the great modern surgeons have been William Halsted, who introduced the use of rubber gloves in aseptic surgery, the famous Mayo brothers, who made many advances in surgery; and Harvey Cushing, the great brain surgeon.

The development of modern surgery has been divided into four different types of advancement. They are: the development of aseptic surgery, the technical improvements that have been made in the instruments for performing surgical operations, the increased knowledge of the processes of the human body, and perhaps most important, the new chemicals that are used to prevent and treat infections. The use of the sulfa drugs and penicillin has been a great factor in the prevention and cure of infections connected with surgical operations which might otherwise prove to be fatal. W.H. COLE

**Related Subjects.** The reader is referred to the BIOGRAPHY section of the READING AND STUDY GUIDE for a list of Physicians and Surgeons, and also to the following topics of general interest:

Amputation	Gastroscope
Anatomy	Medicine
Anesthesia	Plastic Surgery
Antiseptic	Surgeons, American College of
Bandage	Trephining
Barber	Vivisection
Bloodletting	X Rays
Bronchoscope	

**SURINAM**, *soo riĥ NAHM*, is the official name of Netherlands, or Dutch, Guiana. See also DUTCH GUIANA; UNION OF SOUTH AFRICA (map).

**SURINAM TOAD.** This odd-shaped toad is known for the unusual way it raises its young. It is named for

Surinam (Dutch Guiana), in South America, where it was first discovered. The Surinam toad lives in the Guianas, Trinidad, and Brazil. It is very flat. Its head is shaped like a triangle. It has small eyes and no tongue or teeth. The long thin fingers of its front legs are not webbed, but its hind legs have wide webs.

The Surinam toad lives in the water, and has rough brown skin. At breeding time the female's skin grows thick and spongy. As she lays each egg the male places it on her back, and it sinks into her soft skin. The young pass the tadpole stage on the mother's back. They finally come out of the mother's skin after they have grown to be tiny toads.

**Classification.** The Surinam toad is an amphibian. Its scientific name is *Pipa pipa*.

**SURNAME.** See CENSUS (History); NAME, PERSONAL.

**SURPLICE, SUR plis.** See DRESS (Nineteenth Century).

**SURPLUS MARKETING ADMINISTRATION.** See NEW DEAL (Leading New Deal Agencies).

**SURREALISM.** See PAINTING (History of Painting).

**SURREY, EARL OF (HENRY HOWARD)** (1517?-1547). See BLANK VERSE; SONNET.

**SURTAX.** See INCOME TAX.

**SURVEYING**, *ser VA ing*, is the art of determining the shape and area of any part of the earth's surface, or of fixing boundaries. The art of surveying is as old as civilization. It originated in Egypt. Every year the Nile River overflowed its banks and washed out boundaries on the rich farm lands. So every year new boundaries had to be fixed by surveying.

**Types of Surveys** depend upon the use to which the survey is to be put.

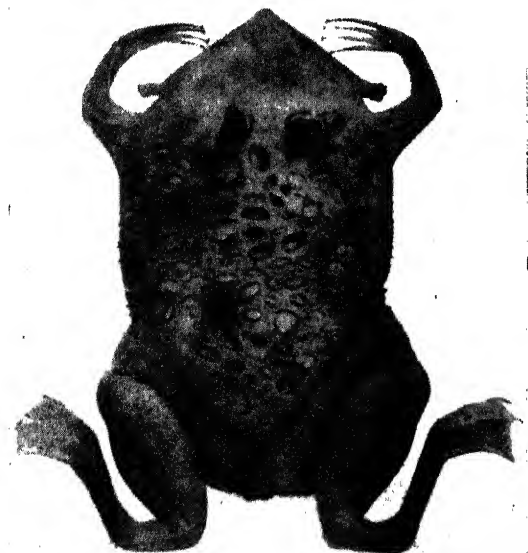
The *land survey* is the type with which people are most familiar. It is used to fix boundaries and to find the areas of plots of ground. In the United States and Canada, the boundaries and divisions of public lands have been fixed by government surveyors. A *plane survey* is used on small plots of ground only, since it does not take into consideration the curvature of the earth's surface. A *geodetic survey* makes allowance for curvature and is used to find large areas or long boundaries.

The *topographical survey* includes the measuring of altitudes of elevations and depressions within the region for the purpose of making maps. Such surveys are usually under the direction of the national government.

*Engineering surveys* are made where buildings, bridges, roads, canals, and other man-made objects are to be built. *Underground surveys* determine where pipes are to be laid or tunnels dug. *Nautical, or hydrographic, surveys* have been used in recent years to map out the bed of a river or lake or ocean. By studying the bed of a river, man can learn how to control the flow of water and how to control erosion. Both have greatly helped navigation.

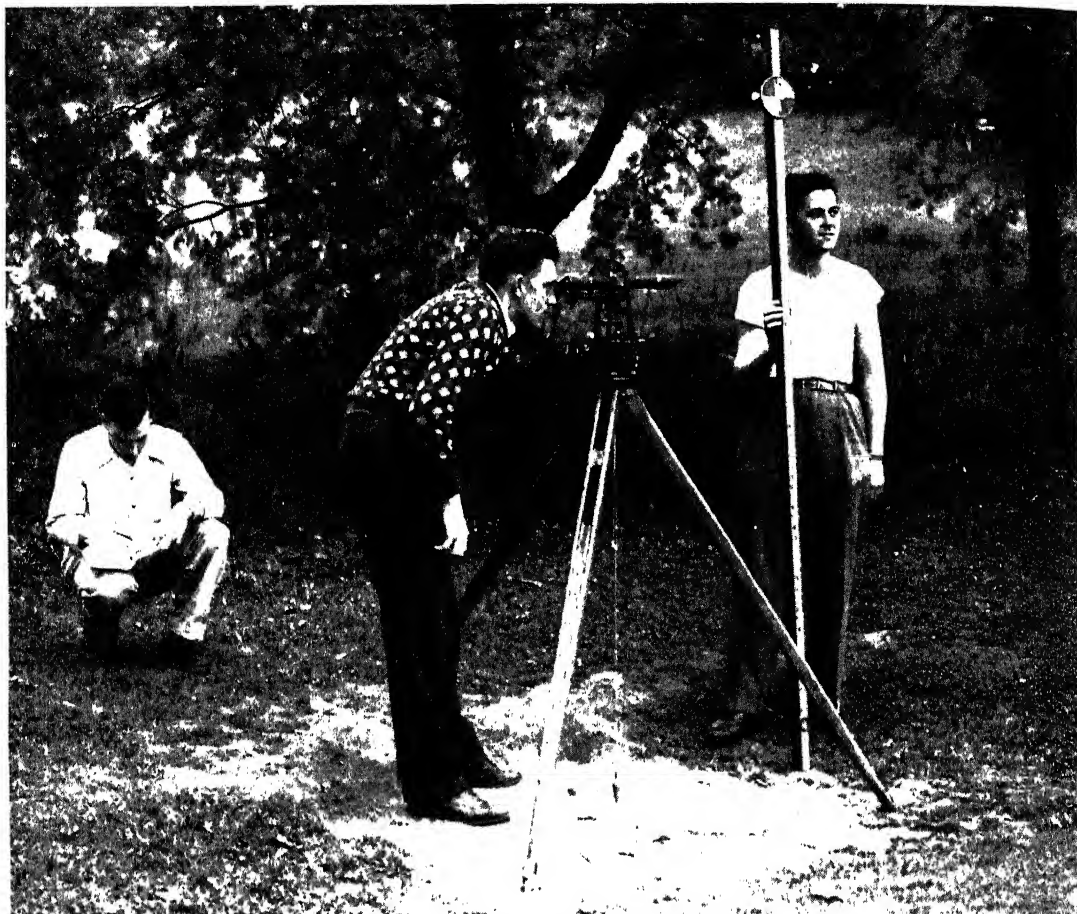
*Aerial surveying, or photogrammetry*, has been developed only since World War I. In this branch, distances on the ground are measured by means of photographs taken from airplanes. It is useful for determining the positions of slopes and depressions.

**Surveying Tools.** The most important of all tools used by the surveyor is the *transit*. This is a small telescope which is set up on a tripod, or three-legged stand. But the transit is much more than just a telescope. To it are



American Museum of Natural History

**The Back of the Female Surinam Toad** provides a living place for the young toads until they are large enough to take care of themselves. The male places the eggs there.



Purdue University

**Engineering Students at a Large University Study Surveying by Actual Work in the Field**

attached both horizontal and vertical arcs, used in measuring horizontal and vertical angles. It has vernier scales by which the surveyor can read very small fractions of degrees. Both the tripod and the telescope may be made level with the aid of attached bubble levels such as used in a carpenter's level. Hanging from the center of the tripod is a weight which drops to the ground at the exact point where the survey is made. This weight is often affected by near-by mountains. Surveyors adjust their calculations for this effect.

Besides measuring angles, the transit judges distances. And with the use of the telescope and levels, the surveyor can determine where ground must be leveled. Some transits also have compasses attached. A surveyor can plot a north-south line simply by pointing his telescope directly north and having a helper place a stake in line with the vertical hair which crosses the center of the telescope.

Measurements are made and lines are run with the use of a long *steel tape*. Most steel tapes come in lengths of fifty, one hundred, or two hundred feet. Where the most precise measurements are required, the *invar tape* is used. It is made of nickel and steel and is less affected by changes in temperature than the steel tape.

**The Basis of Surveying** is geometry. Angles and tri-

angles play a very important part in the work. A surveyor must have a thorough knowledge of mathematics. He must also be able to use delicate instruments with accuracy and precision.

U.S.S.

**Vocational Opportunities.** Modern surveying is closely connected with the various branches of engineering, especially civil engineering. Surveyors find work to do whenever there are roads, dams, and bridges to be built. They determine the boundaries of the property held by individuals, as well as the boundaries of various political divisions. Surveying requires a good head for mathematics and a keen desire for life in the outdoors.

**Related Subjects.** The reader is also referred to:

Base Line	Level
Caliper	Micrometer
Chart	Public Lands
Coast and Geodetic	Surveyor's Compass
Survey	Theodolite
Diagonal Scale	Transit
Geodesy	

**SURVEYOR.** See SURVEYING (Vocational Opportunities).

**SURVEYOR'S COMPASS.** This instrument is used for determining magnetic directions. Although engineer's transits are often equipped with a compass, the true surveyor's compass has no telescopic sighting device.

Pointings are made by open sights similar to rifle sights.

The essential part of a surveyor's compass is the magnetic needle. This is a piece of hard steel that has been magnetized and is balanced to swing in a plane parallel to the horizon. The compass needle generally has a jeweled bearing for its pivot, to reduce swinging friction to a minimum. The ends of the needle are sharpened to knifelike edges, and pass near ruled degree markings. At present, the surveyor's compass is used only in surveys of land of little value, since this instrument is inferior in precision to the engineer's transit.

A compass has several errors that must always be compensated for. First, the balance of the needle on its pivot can actually be for only one zone of magnetic dip, because lines of magnetic force come up out of the earth as well as from the magnetic poles. Therefore, a free-moving needle will always dip as well as swing. Then the lines of magnetic force from the earth are not constant in direction, but vary from day to day and even from hour to hour. Sunspots may cause this variation. The magnetic quality of near-by rocks will also affect the compass needle, and this must be allowed for. The man at the compass can carry no iron on his person. All metal likely to disturb the magnetic needle, such as knives and steel-rimmed glasses, must be left at the base before reading the compass. H.J.S.

See also COMPASS.

**SURVEYORS' MEASURE.** See WEIGHTS AND MEASURES.

**SURVIVAL OF THE FITTEST.** See NATURAL SELECTION.

**SUSA.** See IRAN (Cities).

**SUSPENSION.** A suspension is a mixture which consists of tiny particles of a solid or liquid in a liquid solution. These particles do not actually dissolve in the liquid, but mix with the solution and then settle to the bottom. A common example of suspension is muddy water. The particles of mud are said to be suspended in the water until they settle to the bottom. These particles can be filtered out of the water. The amount of time it takes for the particles to settle depends on their size. The larger particles settle rapidly, while the smaller particles take longer.

When one liquid is suspended in another, the suspension is known as an *emulsion*. This type of suspension can best be illustrated by the mixture of oil and water. At first there will be tiny globules of oil suspended in the water. After a while, these globules of oil will come together and form a layer of oil. One of the many common emulsions is salad dressing, which consists mainly of oil and vinegar. If such dressing is allowed to stand, the two liquids will separate.

Still another type of a suspension is a *colloid*. This mixture consists of fairly large particles of solid which mix with the liquid and never settle. A mixture of starch in water is an example of a colloid. The particles do not settle because they are kept moving by the molecules of the liquid. This movement is known as the Brownian movement. G.L.Bu.

See also COLLOID; EMULSION.

**SUSPENSION BRIDGE.** See BRIDGE.

**SUSQUEHANNA RIVER.** This swift but shallow waterway flows through one of the most important industrial regions in the eastern United States. It is

formed by the union of several small branches. The main stream receives the name "Susquehanna" after it flows out of the Otsego in central New York. The stream flows in a general southwesterly direction to the Pennsylvania line, crosses that state in an irregular course southward, and then flows for a short distance through Maryland. The Susquehanna empties into Chesapeake Bay at Havre de Grace. The total length of the river is about 500 miles. Its chief tributaries are the Chemung, the West Branch, and the Juniata rivers. The Susquehanna is of little value to ships because of its swift current and shallow bed.

Harrisburg, the capital of Pennsylvania, is an important industrial city on the banks of the Susquehanna River. L.D.,JR

**SUSQUEHANNA UNIVERSITY** is a coeducational college at Selinsgrove, Pa. It is controlled and supported by the United Lutheran Church in America, but students of all faiths are admitted. It offers courses in the liberal arts, business administration, business education, and music education. Susquehanna was chartered as the Missionary Institute of the Evangelical Lutheran Church in 1858, and took its present name in 1894. Its average enrollment is about 450. G.M.Sm.

**SUSSEX,** New Brunswick (population 3,027), is the center of a rich farming district about halfway between Saint John and Moncton. Gently sloping hills, fertile valleys, and many small streams make the Sussex region excellent for cattle grazing. Sussex is known for its production of milk, butter, and cheese. The town has a variety of small industries, such as lumbering and the manufacture of ice cream. Railway and bus lines serve the town, which lies on the main highway of the province. M.J.T.

**SUSTAINING PROGRAM.** See BROADCASTING; RADIO PROGRAM.

**SUTHERLAND, GEORGE** (1862-1942). See UTAH (Famous Men and Women).

**SUTHERLAND FALLS** is the fifth highest mountain waterfall in the world. It lies sixteen miles from the head of Milford Sound, in the Southern Alps of South Island, New Zealand. The waters plunge down the mountainside in three leaps from a height of 1,904 feet. The first leap is 815 feet, the second is 751 feet, and the third, 338 feet. Sutherland Falls is formed by water from melting glaciers. The waters of Sutherland Falls flow into Milford Sound. G.B.Cr.

**SUTLEJ, SUT lej, RIVER** is the most easterly of the five waterways of the Punjab region in India, and is the largest branch of the Indus River. The Sutlej rises in the lofty plateau of Tibet, nearly three miles above the sea. The river winds its way through the passes of the Himalayas, crosses the hill states of Simla, and then flows in a southwesterly direction through the Punjab, joining the Indus near Mithankot. The Sutlej is about 950 miles long. Below its meeting point with the Chenab, the most important tributary, it is called the Panjnad, or Five Rivers. The Sutlej is of little importance as a waterway, except for small boats. But its waters are important for irrigating the dry plains of the Punjab. G.B.Cr.

**SUTRO, ADOLPH H. J.** See NEVADA (Famous Nevadans).

**SUTTEE**, *suh TEE*, is a strange custom which was once practiced in India. Its name comes from the Sanskrit word *sati*, which means *faithful wife*. By the custom of suttee, a widow allowed herself to be burned to death beside her husband's body on the funeral pyre. The pyre was a pile of wood or other material which would burn easily. It was raised above the ground like a platform.

No one knows how the custom began. An ancient book states that a widow should lie by her husband's body on the funeral pyre. A few widows, especially the wives of kings, refused to leave the pyre and were burned to death. In 1829 the British Government made suttee illegal. W.D.H.

**SUTTER, JOHN AUGUSTUS** (1803-1880). See SACRAMENTO.

**SUTTER'S FORT**. See SACRAMENTO (History).

**SUWANEE**, or **SUWANNEE, RIVER** is a stream that winds for about 240 miles through southern Georgia and northern Florida and empties into the Gulf of Mexico. The river rises in the swamps of southern Georgia. It drains the great Okefenokee Swamp, one of the largest swamps in the United States. The Suwanee flows in a winding course past small villages and carries no traffic except wide-bottomed rowboats. In Georgia the name of the river is spelled *Suwanee*, while in Florida the spelling is *Suwannee*. The Suwanee has become as famous as many larger rivers because Stephen Foster (who spelled it *Suwanee*) began his haunting and simple song, *Old Folks at Home*, with the words:

Way down upon the Swaner River,  
Far, far away,  
Dere's wha my heart am turning ever,  
Dere's wha de old folks stay. L.D., JR.

**SUZERAIN**, *SU zeh rayn*, is a name sometimes given to a feudal lord in medieval times. Today the term refers to a state which has political control, or *suzerainty*, over another state.

**SUZZALLO, HENRY**. See WASHINGTON (Famous Men and Women).

**SVALBARD**, *SVAHL bahr*. See SPITSBERGEN.

**SVERDLOVSK**, *sverd LAHFsk* (population 425,544), is a trading center in the Sverdlovsk region of the Russian Soviet Federated Socialist Republic. It lies on the eastern slope of the Ural Mountains, about 1,200 miles northeast of Moscow. The city carries on a large trade in cattle, tallow, gold, and iron.

After the Russian Revolution, the Bolsheviks murdered Czar Nicholas II and his whole family at Sverdlovsk, which was then called Ekaterinburg. The date of the massacre was July 16, 1918. W.H.G.H.

**SWAHILI**, *swah HE lee*. The Swahili are a true eastern division of the Eastern Bantu. Their language is spoken throughout eastern Africa, east of the Congo to the great lake region, and as far south as the northeastern coast of Madagascar. The Swahili are of greatly mixed stock, but basically they are Arab plus Bantu. As a rule they tend to be Negroid in appearance, but many persons called "Swahili" are Arab in appearance. The word *Swahili* means *coast people*. W.M.K.R.

**SWALLOW**. The swallow is a small, graceful bird. It has long, powerful wings, and small, weak feet fitted only for perching. Its large mouth is suited to the cap-

ture of insects, which make up nearly all its food. It eats many mosquitoes.

Swallows are found in all parts of the world. Most of them fly long distances to avoid cold or to find a food supply. So far as is known, they migrate, or travel, by day. They fly together in large numbers, and spend the nights in woods or marshes. Some kinds nest in pairs, and some in colonies. Some make their homes in holes in banks or trees. Others build rough nests of clay or mud, which they place on beams of bridges or on rafters in barns or under the eaves. Several kinds of swallows have changed their nesting habits through their contact with man.

Female swallows lay three to nine eggs which are pure white, or white spotted with brown. Swallows twitter rather than sing. They get their food by pursuing flying insects. Some species of swallow have distinctive forked tails, which are called "swallowtails."

The swallows of North America include the *barn swallow*. It has a steel-blue back, chestnut-colored breast, and deeply forked tail. Some of these swallows travel as much as 10,000 miles in yearly migrations. The *cliff swallow* has a square tail and a light brown patch on its rump. The *tree swallow* often nests in birdhouses. The *bank swallow*, or *sand martin*, is the smallest of the family. The *purple martin* is also a swallow. A.A.A.

See also BIRD (Migrations of Birds; illustration, Unusual Nests); MARTIN.

**Classification**. The swallows belong to the family *Hirundinidae*. The barn swallow is *Hirundo erythrogaster*, the cliff swallow, *Petrochelidon albifrons*; the tree swallow, *Iridoprocne bicolor*; the bank swallow, *Riparia riparia*.

**SWALLOWING** is the process of taking food and saliva from the mouth to the stomach through a tube called the *esophagus*. The esophagus is lined with a mucous membrane so that the food can slide down without sticking to the sides. After the food has been chewed in the mouth, it is ready to be swallowed. This is done by the muscles of the walls of the esophagus. These muscles contract, or shorten. The movement of the muscles is in the form of waves or ripples, which move normally in a downward direction toward the stomach. This movement is called *peristalsis*. When the muscles in the esophagus cause abnormal wavelike movements upward toward the mouth, vomiting may take place. When the food reaches the lower end of the esophagus, a ringlike muscle opens and allows the food to pass into the stomach.

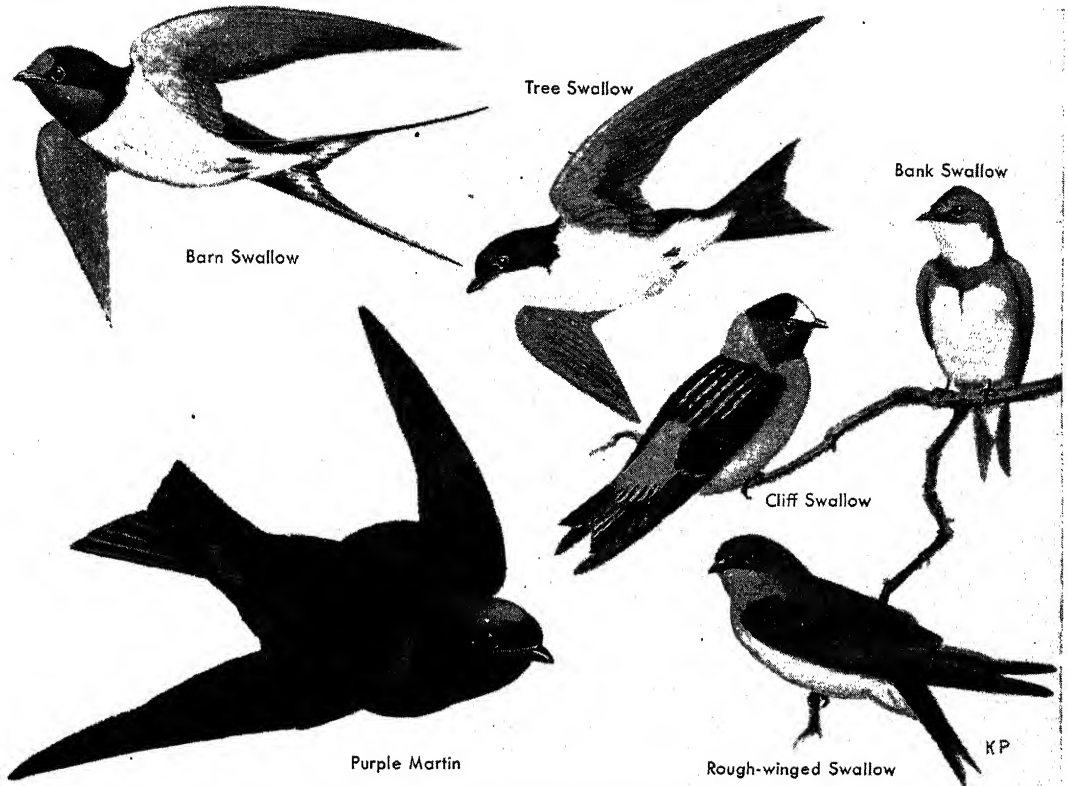
Persons sometimes have difficulty in swallowing because of nervousness or the presence of certain types of diseases. Difficulty in swallowing is due most frequently to nervousness. Inability to swallow may be caused by growths, such as tumors or cancers, on the esophagus. In these cases, the esophagus may close and not allow food to enter the stomach. W.C.BEA.

See also ESOPHAGUS.

**SWALLOWTAIL BUTTERFLY**. See BUTTERFLY; INSECT (color plates, Butterflies [Machreon Swallowtail; Papaw; Paris Swallowtail]).

**SWAMP**. A swamp is land which is more or less completely soaked with water. It is always damp and muddy. A swamp is usually on low ground, near the shore of some large body of water, but there are some





Leading Members of the Swallow Family

swamps on hills. Sometimes the soil on a hill is so formed that it drains very poorly, while water continually bubbles up from springs to keep the hill swampy. Swamps are also formed in lake basins which have become filled with plant life. This kind of swamp is given an Indian name, *muskeg*. A swamp is much like a peat bog, but the swamp's lower layers of soil are not acid like those of a peat bog. Very wet or inundated swamps are termed *marshes*. Mosquitoes often breed in them. In England, particularly near Cambridge and Ely, some marshes are called *fens*. See also DISMAL SWAMP; EVERGLADES; MUSKEG; OKEFENOKEE SWAMP; PONTINE MARSHES. E.D.W.

**SWAMP BUGGIES.** See AUTOMOBILE (Kinds of Automobiles).

**SWAMP BUTTERCUP.** See BUTTERCUP.

**SWAMP DEER.** See SOUTH AMERICA (animal map).

**SWAMP FOX.** See MARION, FRANCIS.

**SWAMP HICKORY.** See BITTERNUT.

**SWAMP ROSE MALLOW.** See HIBISCUS.

**SWAN.** The swan is a stately water bird. It belongs to the same family as the geese and ducks. The swan is very beautiful, with snowy white feathers, and a long graceful neck. Many poets and composers have written about the swan, and it often appears in legends, as in the opera *Lohengrin*.

There are seven species, or kinds, of the swan group. They live in various parts of the world. They have the common habit of flying in V-shaped flocks, and of uttering loud, trumpetlike notes while flying. They eat

worms and shellfish and the seeds and roots of water plants. They dip their long, curving necks far into the water in search of food.

The *American*, or *whistling*, swan nests around the Arctic Ocean and the Hudson Bay region. In winter it flies as far south as the Carolinas. Years ago there were many more of these birds than there are now. Between October and April large flocks of the whistling swans flew southward. It is said they could fly at a speed of forty or fifty miles an hour. They filled the air with sounds ranging from deep bass notes to shrill tones like those of a clarinet. The nests of the whistling swans are made of water plants and lined with down from the bird's body. Single nests are sometimes two feet high and six feet across. The female lays five to seven white eggs in June. The young, called *cygnets*, are at first covered with grayish-brown down. They become snow white by the end of a year. The unattractive appearance of young swans is the basis of the fable called "The Ugly Duckling." The male swan is called a *cob*, and the female a *pen*.

The whistling swan is a little less than five feet long. It is white except for a yellow spot between the nostrils and eyes. The legs, feet, and bill are black. The *trumpeter swan* is like the whistling swan, but it is now rarely seen. It is larger than its whistling cousin, and has a call like the clear, shrill tones of a French clarion.

Swans of the Eastern Hemisphere include the *European whistling swan*, *Bewick's swan*, which is a smaller bird, and the *mute swan*. The mute swan is seen in



**The Black Swan of Australia** is a striking contrast to the white ones of other continents.



**Mute Swans** are the ones commonly seen in parks and zoos. These swans have voices, but are said never to use them in captivity.



**Baby Swans, Called Cygnets**, are taken for their first swim by the parent birds. These are mute swans in a large park.



**Cygnet of a Vanishing Race.** The trumpeter swan has been mercilessly slaughtered by men.

Photos: Arthur H. Fisher; Anderson, Fwing Galloway; Clyde Brown; Fish and Wildlife Service

zoological gardens, parks, and estates. It is said that it never uses its voice in captivity. The *black swan*, which has a scarlet bill banded with white, lives in Australia. South America has the *black-necked swan*. R.M.D.S.

**Classification.** Swans constitute the subfamily *Cygninae* of the family *Anatidae*. American naturalists place most of the species in the genus *Cygnus*. The whistling swan is *Cygnus columbianus*. The Australian swan is *Chenopsis atrata*.

**SWAN, JOHN MACALLAN** (1847-1910), was an English painter and sculptor. He made a careful study of animals and included them in many of his paintings and sculptures. Probably his best-known painting is "The Prodigal Son."

**SWANSEA.** See WALES (Cities).

**SWARM.** See BEE (Swarming to Start a New Home).

**SWARTHMORE COLLEGE** is a coeducational school at Swarthmore, Pa., eleven miles southwest of Philadelphia. It was founded in 1865 by the Society of Friends, but is not controlled by that society. The school offers courses in liberal arts and has a division of engineering. The courses lead to B.A. and B.S. degrees.

Honors work enables superior juniors and seniors to advance as quickly as they choose. They attend small seminars twice a week instead of going to regular classes. Visiting examiners give written and oral examinations every two years.

Dormitories on the campus provide residence facilities for all students except those who have special permission to live at home. A generous provision for scholarships, grants-in-aid, loan funds, and college jobs helps many students to reduce their college expenses substantially. Swarthmore's average enrollment is about 670. E.L.H.

**SWARTHOUT, GLADYS** (1904- ), is an American mezzo-soprano. She was born in Deepwater,



Metropolitan Opera Co.  
**Gladys Swarthout**, noted star of opera and radio

Mo., where she sang in church at the age of twelve. After she was graduated from high school, she went to Chicago to study singing for three years. She also continued to sing in churches. In 1924 she joined the Chicago Opera Company where she sang small parts. In 1927 she was engaged for more important roles by the Ravinia Opera. Two years later she became a member of the Metropolitan Opera Company in New York City. Her popularity grew after her concert and radio work and appearances in motion pictures. F.B.

**SWASTIKA**, *SWAS tih kah*, is an ancient symbol often used as an ornament or a religious sign. The swastika is in the form of a cross with the ends of the arms bent

much of the land is unproductive and farming has not been very successful.

Most of the natives of Swaziland are Swazis, a branch of the Bantu race, and related to the Zulus. The chief languages are Swazi and Zulu. The capital of Swaziland is Mbabane. Swaziland is governed by His Majesty's High Commissioner for Basutoland, the Bechuanaland Protectorate, and Swaziland. H.V.B.K., JR.

See also MBABANE.

**SWEAT**, *swet*. See PERSPIRATION.

**SWEATING SICKNESS** is a fatal disease first known in 1485. An attack begins with cold chills, dizziness, headache, body pains, and prostration. Profuse sweating follows, and continues until death. The disease is sometimes fatal in a few hours. A modern form, called *military fever*, is not usually fatal.

**SWEATSHOP**. The word *sweatshop* suggests a place of grinding toil. It is a very fitting term for makeshift factories where poverty-stricken people — mostly women and children — work at top speed for twelve or more hours a day in an effort to earn a living wage.

The sweatshop, which is often called the *sweating system*, began when the factory system developed in the early 1800's. As machines took the place of hand labor, more and more persons were thrown out of work or forced to work for low wages. The buildings that housed the swiftly growing factories were not large enough to do all the work on many articles. So the factory owners sublet contracts for part of the work to other manufacturers.

These other manufacturers, in turn, set up makeshift factories in dimly lighted and poorly ventilated sheds or in tenement-district houses. They hired workers on a piecework basis. They paid so little for each piece of work that the workers were forced to work very fast for long hours each day in order to earn enough money to live.

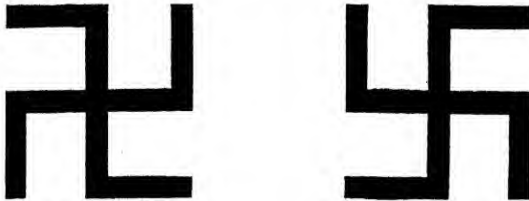
As early as 1830, the people of the United States began to object to the sweatshop system. But the problem did not become very serious until after 1880, when large numbers of immigrants began to come to America. The owners of sweatshops in large cities took advantage of the ignorance and poverty of the immigrants to get them to work for extremely low wages. The clothing and needlework industries were the worst offenders. Cigar making and some of the mechanical industries also used the sweating system.

In the 1900's, states began to pass laws prohibiting workers from carrying on work outside the factory in industries where sweatshops were most common. They also passed minimum wage laws which made it impractical for factories to sublet work. Laws limiting the number of hours women could work and abolishing child labor were heavy blows to the sweatshop system. Another factor which hastened its decline was the increased interest which women showed in metal-working and other trades where they could not take work outside the factory. Today, there are few sweatshops left in the world. In most countries, the ones that are left are operating illegally, and progressive-minded people look forward to the day when they will be wiped out. R.D.P.

See also WAGES AND HOURS.

**SWEDE**. See RACES OF MAN (color plate, Europe).

## SWASTIKA



Oriental and American Indian

Nazi

at right angles in a given direction, usually clockwise. The swastika has been found on Byzantine buildings, Buddhist inscriptions, Celtic monuments, and Greek coins. The counterclockwise swastika was widely used among the Indians of North and South America. The clockwise swastika was adopted in 1933 as the symbol of the National Socialist Party of Germany. As such it came to be one of the most hated symbols in the history of man. It came to stand for all the evil associated with the Nazis as they spread their control over Europe before and during World War II. After the Nazis came to power in Germany, they put the swastika on the official flag of Germany. After the Allies conquered Germany in 1945, they banned the display of the swastika emblem at any place in Germany. J.W.SW.

**SWAZILAND**, *SWAH zee land*, is a small British protectorate on the northeastern border of the Union of South Africa. The protectorate is less than fifty miles from the Indian Ocean. It covers an area of 6,705 square miles, and has a population of 156,715, including 2,740 Europeans.

Mountain ranges in western Swaziland rise to heights of 4,000 feet above sea level. To the east are malarial lowlands which are only 400 feet above sea level. Swaziland is a grass- and bush-covered country without forest resources. Nearly half a million cattle are raised on this land each year, and a quarter million sheep are brought in from the Union of South Africa each year for grazing during the cooler season. The natives of Swaziland raise corn and vegetable crops for their own consumption. Europeans grow cotton, tobacco, and citrus and other fruits for commercial purposes. Small amounts of gold, tin, and asbestos are mined.

Some of the natives work in the mines of the Union of South Africa, but most of them have remained on the native reserves. The natives own about one third of the land in the protectorate, and have a greater degree of independence than the natives in South Africa. But

# SWEDEN



Rwiny; Galloway; Gullers, Black Star

**SWEDEN** is one of the world's happiest and best-managed countries. It lies in the hills and plains of the eastern and larger part of the Scandinavian Peninsula, in northern Europe. The Swedes call their country *Sverige*, which means *state of the Swedes*.

Thick forests grow on Sweden's mountains, and great beds of iron ore lie under the ground. Sweden has more lakes and streams than any other European country except Finland. The power of the rivers and waterfalls has been harnessed to run great factories and plants, and to make light for city homes and farmhouses. The Swedes have used their resources of timber, iron, and water power to build wealth for their country and people. Sweden is a wealthy country ruled by progressive ideas. Most of the Swedes have comfortable homes and plenty to eat.

The Swedish way of life has often been called "the middle way." Sweden is not socialistic, for individuals still own and manage private property. But no individual has the right to harm the community by his use or misuse of his property.

Sweden is a monarchy, and the king is the nominal head of the government. But the people rule themselves much more fully than do the people of many republics. The actual government is elected by the people, and owns most of the railroads and other public utilities. It has the power to see that the nation's resources, such as the forests, shall not be wasted. The government regulates the liquor industry and tells the munitions makers what they can make and to whom they may sell their products.

Swedish men and women have made many contributions to world science, art, and literature. Swedish writers such as Selma Lagerlöf and August Strindberg are known throughout the Western world. The Swedish naturalist, Carolus Linnaeus, was the founder of modern botany. A Swede, John Ericsson, built the *Monitor*, the first armor-plated boat, which was used in the War between the States. Another Swede, Anders Celsius, was the inventor of the centigrade thermometer. A Swedish industrialist named Alfred Nobel discovered dynamite and later left an immense fortune to provide

prizes for outstanding achievement in the fields of science, the arts, and world peace. See **NOBEL PRIZES**.

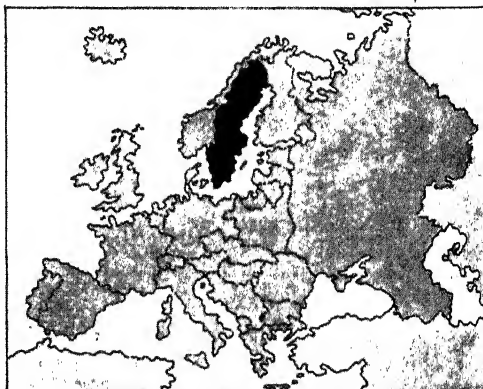
Sweden has been able to lead its own life in peace for more than one hundred years. The Swedes remained neutral in both World Wars I and II. They suffered during World War II, because they were shut off from the rest of the world by the German and British blockades. But their sufferings were not nearly so great as those of the people of such invaded countries as Norway and Denmark. When the war was over, Sweden entered at once upon a new period of development and prosperity.

## The Land and Its Resources

**Extent:** Area, 173,403 square miles. Water area, 15,600 square miles. **Greatest length,** 1,000 miles. **Greatest width,** 250 miles. **Coast line,** 1,400 miles when measured in straight line, 4,700 miles counting bays and indentations.

**Physical Features:** **Chief mountain range,** Kjölen Mountains. **Chief peaks,** Kebnekaise, Sarjeltjakkö. **Elevation,** highest, Mt. Kebnekaise, 6,965 feet above sea level; lowest, sea level, along the coasts. **Chief rivers,** Torne, Lule, Pite, Skellefte, Vindel, Angerman, Klar, Gota. **Chief lakes,** Vänern, Vättern, Hjälmarn, Mälarn. **Chief islands,** Öland, Gotland. **Chief waterfall,** Trollhättan, in the Gota River.

**Location, Size, and Surface Features.** Sweden lies directly east of Norway. Finland lies just east of Sweden, across the Gulf of Bothnia. The southwestern coast of Sweden is separated from Denmark by the narrow waters of the Sound and by the straits called the Kattegat and Skagerrak. The Swedish city of Helsingborg, on one side of the Sound, is only two and a half miles from the Danish city Helsingör, on the other side. For the boundaries of Sweden, see the colored map.



Location of Sweden Shown in Black

## Pronunciation Guide

Branting, Hjalmar	Kjölen CHUH len
HYAL mahr	Öland uh LAHND
Gota TUH tah	Riksdag RIKS dahg
Gotland GOHT land	Trollhättan TROLL het en
Kebnekaise KEB neh kays	Vänern VEH nern

Sweden is about two hundred miles longer than the state of California, but is not nearly so wide. It is about as big as the states of Illinois, Kentucky, Ohio, and Indiana put together.

The mountainous parts of Sweden are the northernmost region, called Norrland, and a region of rocky cliffs and peaks in the west. The Kjölen Mountains run along most of the Norwegian border. The most rugged scenery and highest peaks are in the north. Sweden is a region of rolling, forest-clad hills, green meadows, and beautiful lakes. The fertile plains of Scania lie in the extreme south.

**Coast Line.** The wooded, rocky coast of Sweden is picturesque, but it does not have such rugged grandeur as the Norwegian fiords. The eastern coast is deeply cut by many bays and sounds and is bordered by many islands. The islands are most numerous near the city of Stockholm. Gotland and Öland, two of the largest islands in the Baltic Sea, belong to Sweden. The coast and islands of the Gulf of Bothnia are low and rough. On the Baltic, there are gleaming white cliffs in some places, and in other places there are beaches. Gloomy, bare cliffs border the shores of the Kattegat and Skagerrak, and dangerous rocks lie just below the surface of their waters.

**Rivers and Lakes.** Most of Sweden's many rivers rise from lakes in highlands along the Norwegian border. They flow southeast to the Gulf of Bothnia and the Baltic Sea. Many of the rivers broaden into wide channels or lakes as they flow eastward. The Torne flows 290 miles through large lakes and forms the boundary with Finland on the northeast. Other important rivers include the swift Lule, the Pite, the Skellefte, the Vindel, and the Ängerman. Ocean vessels can sail seventy miles up the Ängerman River. The Klar rises in Norway and flows south to Lake Vänern. The most important river for trade is the Gota, which flows from Lake Vänern to the Kattegat. At Trollhättan the Gota has six beautiful falls which develop 700,000 horsepower of electricity.

Many long narrow lakes lie in the deep valleys between Sweden's steep mountains. But Sweden's largest lakes are in the lowland region of the south. Lake Vänern covers an area of 2,149 square miles, and Lake Vättern has an area of 733 square miles. Other large lakes are Hjälmars and Mälars. Stockholm lies on the shore of Lake Mälars and of Saltsjön Bay, which washes the shores of 1,300 islands.

**Climate.** Sweden has a drier climate than Norway. The Gulf Stream and the many lakes make the country

warmer than many other countries that lie to the north. There is a wide difference between the temperatures of Lapland, in the north, and Scania, in the south. The northern tip of Sweden lies above the Arctic Circle, in the Land of the Midnight Sun. Here the winter lasts seven months, and spring and autumn are very short. In the south, Sweden has a climate somewhat like that of the state of Maine. Central Sweden, near Stockholm, has an average temperature of 62° Fahrenheit for July and 27° F. for January.

Rainfall throughout the country averages about 20 inches a year. It is heaviest in the south. In northern Sweden the average rainfall is only about 13 inches a year. Most of the rain falls in the late summer. The harbors of northern Sweden are always ice-locked during the long winters. Those of central Sweden are also generally frozen in wintertime.

**Natural Resources.** Thick forests cover more than half of Sweden. The uplands and mountains have dense growths of pine, spruce, birch, and mountain ash. Thick groves of oak trees border the lowland lakes. Beech forests separate the cultivated fields of Scania. Most of the woodland area belongs to the government. Swedish law regulates the amount of timber which may be cut, and more trees are replanted than are cut. A large wooded area in the north has been made into a national park where hunting and logging are forbidden.

Sweden has great mineral resources. The northern and midland regions are especially rich in iron. Swedish iron ore is better than that of any other European country, and is so pure that it is famous throughout the world. Deposits of copper, silver, gold, nickel, coal, lead, zinc, and sulfur pyrites are found in various parts of the country. The rocky regions of Lapland are especially rich in minerals, but mining is difficult there.

Sweden has greater water-power resources than any other European country except Switzerland. Many power plants have been built, but there is still much unused power in the north. The southern and northern power systems have been connected so that the vast water power of the north can supply electricity for southern farms and industries.

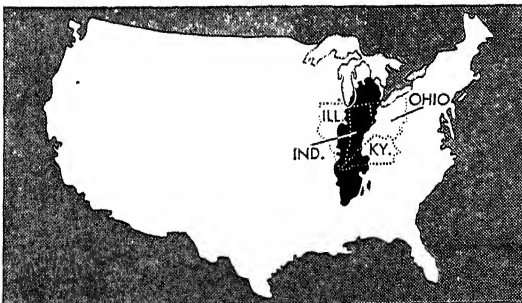
### The People and Their Work

**Population:** 6,597,348. *Density,* 41.6 persons per square mile. *Distribution,* rural, 60 per cent; urban, 40 per cent.

**Chief Products:** *Mineral,* iron ore, copper, silver, lead, zinc, manganese, sulfur pyrites. *Forestry,* lumber, cellulose, wood pulp. *Agricultural,* wheat, rye, barley, oats, legumes, potatoes, sugar beets, fodder-roots, hay, cattle. *Manufactures,* furniture, paper, and other timber products; iron products, porcelain, ships, motors, food products, dairy products, chemicals, electrical machinery, farm machinery, matches.

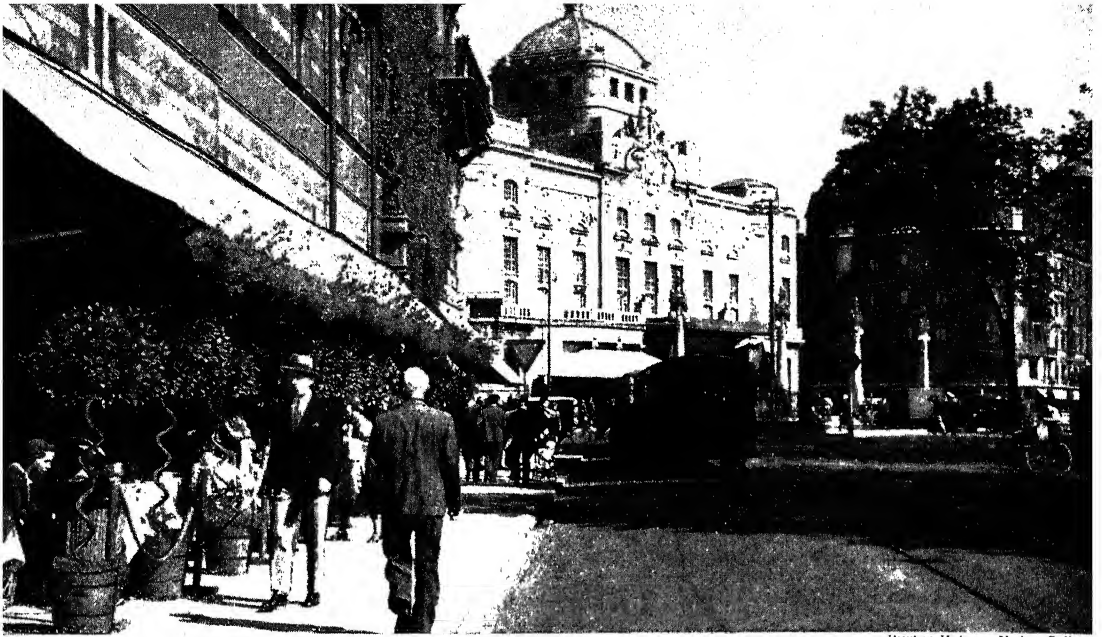
**The People.** The Swedish people are Teutonic in origin, which means that they are closely related to the Norwegians and Danes, and to a lesser extent to the Germans. The Swedes, as well as other Scandinavians, are among the world's most progressive peoples. They have a high reputation for honesty, politeness, industry, and intelligence.

Most of the people in Sweden are Swedes. But there are also 8,041 Finns and 6,481 Lapps. The Lapps live in the far north. The Swedish Government provides



Area of Sweden Compared with the Central States





Burton Holmes, Ewing Galloway

**The City of Stockholm** is regarded by travelers as one of the most beautiful in Europe. This broad street is lined with in-

viting cafes and attractive shops. In the middle background the imposing building of the Dramatic Theater.

them with schools and other advantages, but allows them to live in their own way. They are a wandering people who herd reindeer and move about as the seasons change.

Many Swedes have gone to live in other countries. A large number of them settled in the northwestern part of the United States, especially Minnesota. But the population of Sweden has doubled in the last hundred years, in spite of the emigration. The country is still more thinly populated than most European countries.

The Swedish language is a North Germanic language. It is somewhat like Danish, but it has a more musical sound.

**Agriculture.** About one third of the Swedish people earn their living by farming. One tenth of the land is farmed. The farms are usually small, ranging from five to fifty acres. Independent farmers own most of them. The best regions for growing farm crops are Scania and the Baltic islands. Many of the marshes in the lowlands have been drained and cultivated. The chief crops are hay, root crops for feeding farm animals, potatoes, sugar beets, oats, barley, wheat, and rye. Sweden produces enough food for its own people. But Swedish farmers buy imported fertilizer and cattle feed.

Southern Sweden is also a rich grazing region, where cattle raising and the herding of hogs are important. Dairy products and bacon are shipped to England and Germany. There are small areas of natural pasture throughout the country. The Swedes herd goats on the hilly slopes. Even in the far north, herds of reindeer find enough grazing that they can keep the Lapps in food and clothing.

The Swedes farm efficiently. They use farm machinery and modern farming methods. Almost half of the farms are supplied with electric power. The government has a wide program of agricultural education. Boys and girls belong to farm clubs which are very much like the Four-H clubs in the United States.

**Forestry Products.** The forests of Sweden furnish material for the country's most important industries. Lumber and other wood products make up more than half of Sweden's exports. The rivers carry logs to sawmill factories, and ports on the eastern coast. During World War II, wood was more important than ever to Sweden because it was used for fuel to replace oil and coal. Much of the logging is carried on by Swedish farmers.

**Minerals.** The invention of electric mining machinery has made it possible to develop the great mineral resources of northern Sweden. One of the chief iron mining centers is a town in Lapland called Kiruna, although the purest iron ore comes from iron fields located farther south.

Copper was once an important mineral product of Sweden, but its production has fallen off. The center of the northern copper industry is Kristineberg, in Lapland. This mine produces about one third of the entire Swedish output.

**Fisheries.** The Swedish fishing industry centers around the southwestern coast, especially the port of Göteborg. But the rivers and coastal waters of Sweden are not so well filled with fish as those of Norway. The Swedes like to eat fish, and they import some of their supply.

**Manufactures.** The vast electric power furnished by the southwestern rivers is used for manufacturing. Factories have been built in rural districts and small towns throughout Sweden. The most important manufactures include finished lumber, furniture, wood pulp, cellulose, and paper. Sweden sells more paper abroad than any other country except Canada. Sawmills are located in the east, especially along the Gulf of Bothnia. There are iron-smelting plants and foundries in the midland districts. Other factories manufacture metal products, machinery, chemicals, leather and rubber goods, clothing, textiles, glass, and porcelain. Still other plants refine oil and process food. Jönköping, in southern



**A Party of Swedish Sportsmen** try their luck in the cold waters of the Torne River in far north Lapland. The Swedes are

enthusiastic hunters and fishermen in a country that abounds with beautiful lakes and streams and vast forest areas.

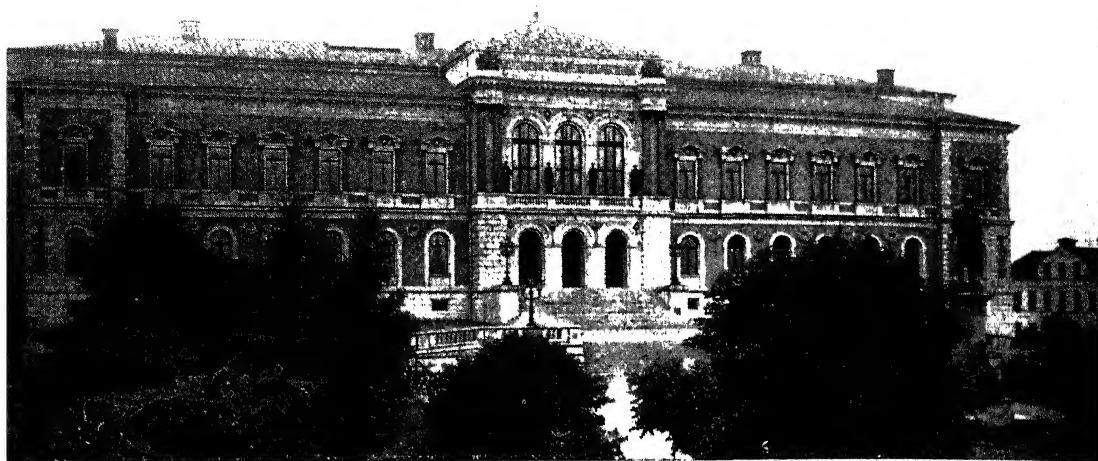


**Swedish Country Folk** come to church by boat. Churches often stand at the water's edge, and parishioners row to them.



Photos: Swedish Travel Information Bureau; Pix

**Stockholm Occupies a Series of Islands** and peninsulas. The city is often called "The Venice of the North."



From Galloway

**The Administration Building of the University of Uppsala** is surrounded by a well-kept park so characteristic of

Swedish cities. The university is one of the best-known and oldest in northern Europe. It was founded in 1477.

Sweden, is the center of the important match industry.

**Co-operatives.** Co-operative societies play an important part in the economic life of Sweden. More than one third of the people belong to such societies. The co-operatives run retail stores where food and other articles can be bought at the lowest possible prices. The societies have forced down the general price level, for people will not pay higher prices in private stores than they pay in co-operative stores. The local co-operatives are joined together by a national co-operative league. This national organization purchases goods at wholesale prices for its members. It also runs its own factories, which turn out margarine, automobile tires, paper, shoes, electric-light bulbs, and other products for the member stores.

**Labor.** Sweden has very strong labor organizations. The National Trade Union Federation has more than a million members. Union members and their families make up about half the population of the country. The employers are also strongly organized. But labor conflicts seldom take place. This is because labor unions and employers follow well-organized methods of conference and agreement. These procedures are regulated by Swedish law.

**Transportation.** Sweden has 55,550 miles of roads and 10,486 miles of railroads. Most of the railroads are owned by the state and operated by electricity. In addition, there are more than 2,500 miles of rivers, canals, and lakes on which boats can run. Boats use Sweden's most important canal, the Gota Canal, when they cross southern Sweden from the Skagerak to the Baltic. They follow a long waterway made up of the canal, the Gota River, Lake Vänern, and smaller lakes.

Air travel is becoming increasingly important in Sweden. Today most of the cities have airports. The Bromma airport, near Stockholm, is a stop on many chief European air routes.

Sweden has more telephones in proportion to the number of its people than any country in the world except the United States. Most parts of the country also have telegraph service and radio stations.

**Foreign Trade.** Sweden has a large peacetime trade for a country of its size. Its merchant marine carries cargoes for foreign nations as well as for Sweden. Swe-

den's best customers are Great Britain, the Soviet Union, the United States, Denmark, and Norway. The chief imports are coal, metal goods, machinery, motor vehicles, raw textiles, and foodstuffs. The chief exports are wood pulp, paper, and other wood products. Göteborg and Stockholm are the leading ports. Malmö and Hälsingborg are also important.

**Cities.** Stockholm, the capital and largest city of Sweden, is discussed under its own title in *THE WORLD BOOK ENCYCLOPEDIA*. Other important cities are described below.

**Göteborg**, *YUH tuh BAHIR y'*, or **Gothenburg**, *GAHT en-burg* (population 309,348), is Sweden's second largest city. It is the chief port on the southwestern coast. Göteborg lies on the Kattegat and is connected with Stockholm, on the east coast, by the Gota Canal. Göteborg's harbor is seldom blocked with ice. The city ships more lumber and wood products than any other port in Sweden. The industries in Göteborg include cotton-spinning, lumber processing, shipbuilding, and the manufacture of iron and steel. The city has a university, as well as technical, nautical, and commercial schools.

**Malmö**, *MAHLM uh* (population 167,885), is the third largest city of Sweden. Malmö lies on a level plain on the southwestern coast, almost at the tip of Sweden. The city of Copenhagen is just across the Sound in Denmark. Malmö exports foodstuffs, lumber, and other products to European ports. Eight railroad lines connect it with other cities of Sweden. The city has a modern airport. Its beautiful town hall dates from 1546.

#### Social and Cultural Achievements

**Leading Universities:** Uppsala founded in 1477; Lund, 1668; Stockholm, 1877; Göteborg, 1889.

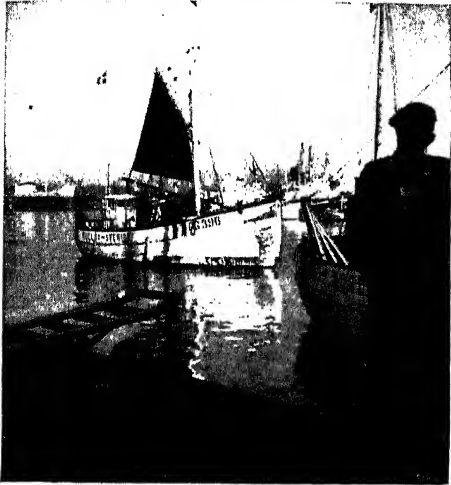
**Museums:** National Museum, Nordic Museum, and Skansen Museum, at Stockholm; Röhss Museum of Arts and Crafts, at Göteborg.

**Education.** Almost everyone in Sweden can read and write. Education is free and school attendance is required by law. The government supports an excellent school system. The state universities at Uppsala and Lund are among the oldest schools in Europe. The universities at Stockholm and Göteborg are privately financed, and offer courses in many fields. There is also a state-owned Surgical Institute at Stockholm.

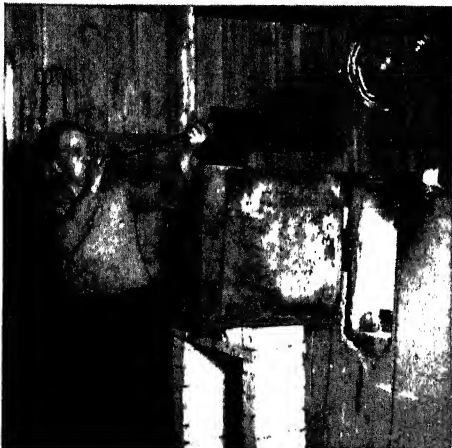
Sweden has many special schools. These include the national College of Agriculture at Ultuna, the Dairy



**Against a Background of Tall Apartment Buildings,** a log driver keeps a sea of timber from jamming as it floats down the river through Stockholm, the capital. Great quantities of lumber and lumber products are exported from the city.



**Sturdy Fishing Boats** swarm about the great harbor and port of Göteborg.





De Con, Ewling Galloway  
**The Massive Wall and Towers at Visby recall the Middle Ages, when the city was an important trading center.**

School and Horticultural Institute at Alnarp, and many other agricultural schools. The country's foresters are trained at a government institute of forestry at Stockholm and at other small forestry schools. There are schools of mining at Stockholm, Falun, and Filipstad.

**Libraries.** The first library in Sweden was the Royal Library at Stockholm, established in 1585. This collection has since been broken up. Today there are many libraries of various kinds throughout the country.

**Arts and Crafts.** From earliest times, Sweden has been very rich in crafts, arts, and culture. Swedish literature began with the written laws of the 1200's. The earliest verses were the popular ballads and folk songs of the 1400's. The modern age of Swedish literature began during the reign of Gustavus III (1771-1792), who was a patron of learning. Modern realism deeply influenced Swedish literature at the end of the 1800's.

Swedish painters, sculptors, and musicians have also made valuable contributions to the world's store of pictures, statues, and musical compositions. The internationally best-known Swedish artists were Anders Zorn and Bruno Liljefors.

Art is part of daily life in Sweden. Many modern office buildings and factories are made colorful with mural paintings by well-known artists. The farming population has never forgotten its old skills of weaving and embroidering. Swedish artists work closely with industry in producing furniture and household articles which are simple, beautiful, and colorful. Home decoration and arrangement of furniture and colors are taught to young people in the schools as an important part of their education for life.

Swedish ideas about home furnishing have had a strong influence in other countries. Many American living rooms are furnished in the style known as "Swedish modern." Swedish modern furniture is made of light or bleached woods, built simply and without decoration. Pleasant bright colors are used for upholstery and drapery materials. Swedish glass and Swedish pottery are known for their simple beauty in many parts of the world.

**Religion.** The state church of Sweden is the Lutheran faith. Ninety-nine out of a hundred people in Sweden are members of this church. There are also small groups

## SWEDEN

of Baptists, Methodists, Roman Catholics, and Jews.

**Recreation.** The Swedes are strong believers in physical education. They make calisthenics and sports an important part of school training. They are fine skaters and skiers and enjoy swimming and other water sports. The Swedes love the sun and like to be outdoors as much as possible during the short summer.

### Government

**Ministry:** Sixteen members, including Prime Minister.  
**Riksdag (Parliament):** Upper Chamber, 150 members, elected for eight years; Lower Chamber, 230 members, elected for four years.

Sweden is a constitutional monarchy. The constitution was adopted in 1809, and has since been changed and modified. The Swedish parliament is called the *Riksdag*. It is made up of two houses, or chambers. The upper chamber has 150 members, elected for eight years by the councils of the cities and provinces. These councils are called *landstings*, or *landsthings*. The members of the lower house are elected by popular vote. All men and women over the age of twenty-three may vote in national elections.

The real head of the government is not the king, but the Prime Minister. He is assisted by ten department chiefs and five other ministers who make up his cabinet. This cabinet holds weekly meetings, over which the king presides. Whenever the Riksdag disagrees with the ministry on an important question, a new Prime Minister is chosen.

**Political Parties.** The most important political party in Sweden is the Social Democratic party, which is much like the British Labor party in its belief in moderate socialism. Other Swedish parties include the Conservative party, the Liberal party, the Agrarian party, and the Communist party. Except for the Communists, all these parties approved of Sweden's neutrality policy during World War II. During the war the national government was made up of representatives of several parties. But at the end of the war, the Social Democratic party won a large majority in the Riksdag and a new ministry of Social Democrats was formed.

Sweden is divided into twenty-six counties for local administration. Government in the cities and provinces is based on the principle of local self-government.

### History

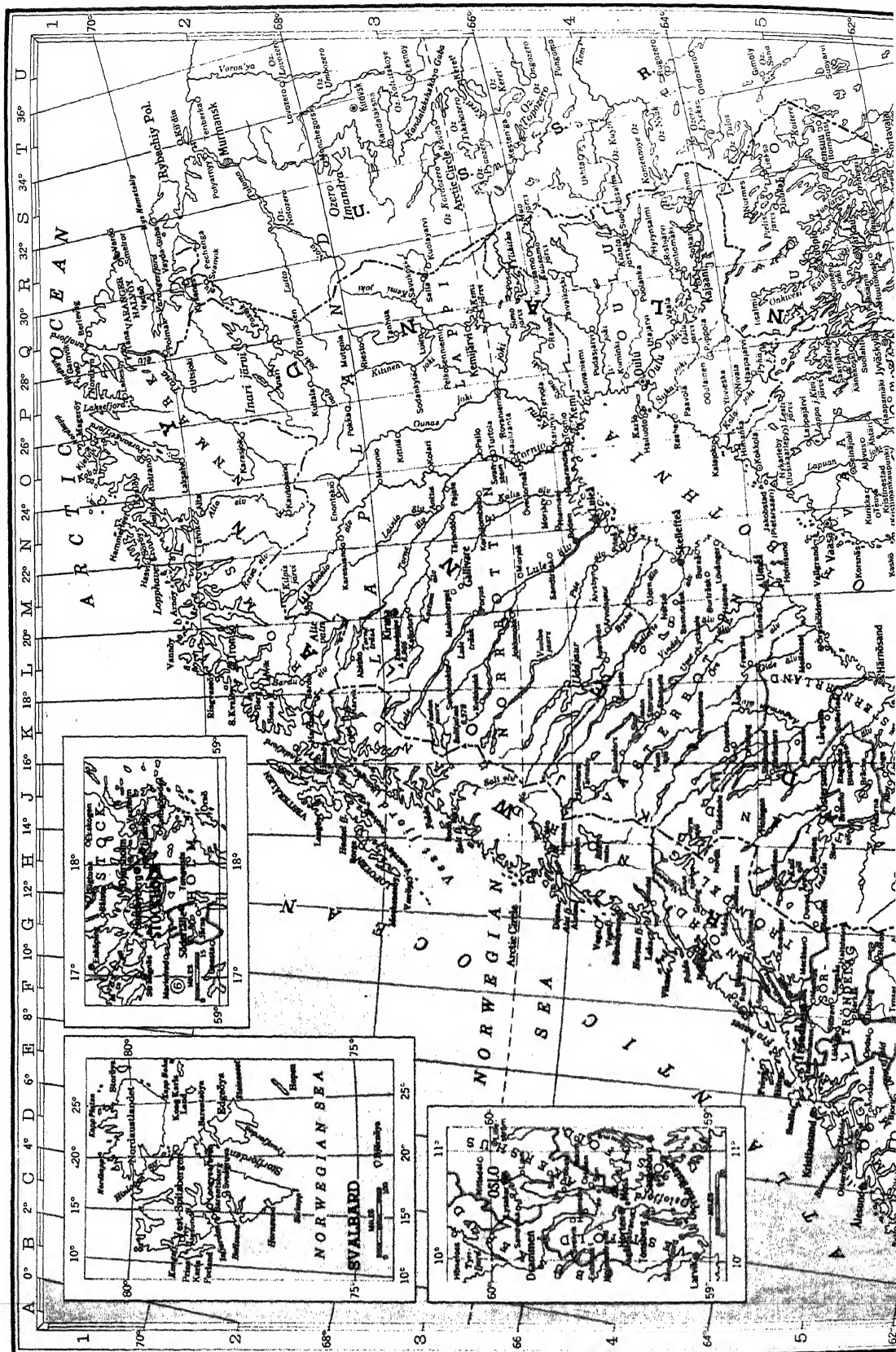
**Early Years.** People lived in Sweden as far back as the late Stone Age. Historians believe that the people who lived in Sweden during the Stone Age were probably the ancestors of present-day Swedes. Sweden has not had any invasions or large-scale immigrations within historical times. But some of the great migrations of history started from Sweden. One tribe called the Goths, left Sweden and wandered all over Europe. The region in central Sweden where they once lived is still called Götaland, or the land of the Goths. The Goths who stayed home were conquered by another Swedish tribe called the *Svear*. The Roman historian Tacitus mentioned the *Svear* in his writings. The history of Sweden as a country began when the Goths and the *Svears* intermarried and became one people.

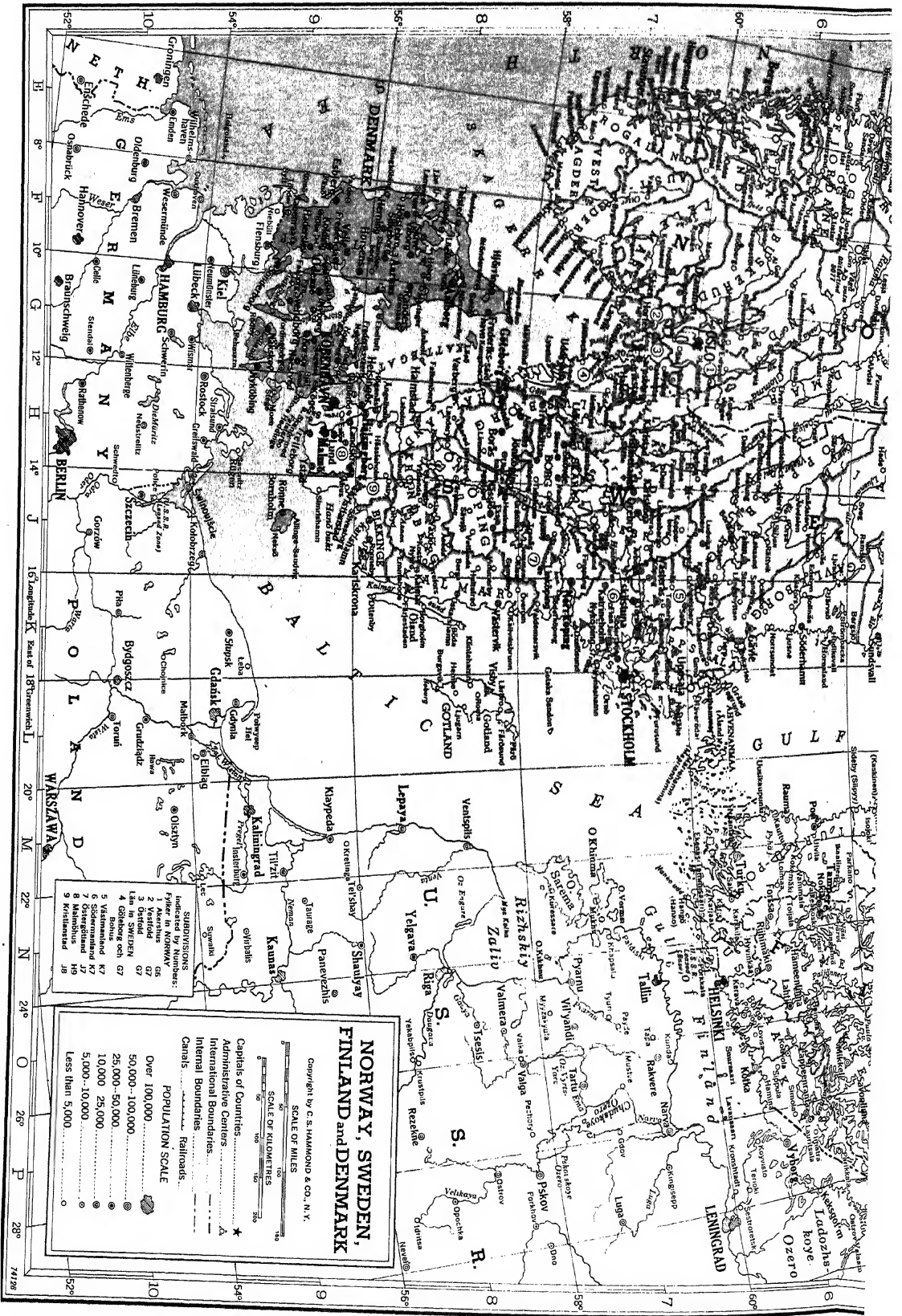
**The Viking Period.** Migrations from Sweden con-



# NORWAY, SWEDEN, FINLAND AND DENMARK

DENMARK		Heinola, 2,933	P 6	Bindal	H 4	Lakselv	O 1
Aabenraa, 12,189	F 9						
Aalborg, 60,880	G 8						
Aarhus, 107,393	F 8						
Allinge Sandvig, 2,195	J 9						
Anholt (island), 218	G 8						
Bornholm (island), 47,185	J 9						
Brønderslev, 7,275	F 8						
Ebeltoft, 2,104	G 8						
Esbjerg, 43,241	F 9						
Faaborg, 4,699	G 9						
Faenø (island), 77	F 9						
Frederiksborg, 963	F 9						
Ikshavn, 16,827	G 8						
København, 18,930	H 8						
Herning, 16,285	F 8						
Hillerød, 8,887	H 9						
Hjørring, 13,446	F 8						
Hobro, 7,699	F 8						
Holbæk, 13,467	G 9						
Holstebro, 13,212	F 9						
Horsens, 32,400	G 9						
capital), 7							
Køge, 9,683	H 9						
Kolding, 27,660	F 9						
Korsør, 10,667	G 9						
Laesø (island), 3,400	G 8						
Lemvig, 5,245	F 8						
Limfjord	F 8						
Løgstør, 3,193	F 8						
Lolland (island), 87,150	G 9						
Mariager, 1,383	G 8						
Middelfart, 8,089	G 9						
Moen (island), 14,156	H 9						
Naestved, 15,104	G 9						
Nakskov, 15,506	G 9						
Neksø, 3,074	J 9						
Odense, 92,436	G 9						
the Sound)	H 9						
Ringsted, 4,396	E 8						
Ringsted, 7,835	G 9						
Rødby, 3,511	G 9						
Römö (island), 747	F 9						
Rønne, 11,497	J 9						
Roskilde, 23,497	G 9						
Rudkøbing, 4,308	G 9						
Skagen, 6,446	G 8						
Skagens Rev (cape)	G 8						
Skanderborg, 4,171	F 8						
Skive, 12,369	F 8						
Slagelse, 18,073	F 9						
Sønderborg, 14,125	F 9						
2,140							
6,778							
8,118							
27,107							
L 6							
O 6							
N 4							
N 6							
O 4							
Hämeenlinna (Tavastehus), 11,257	O 6						
Hangö (Hank	O 6						
Berg	K 2						
B 108,933	D 6						
	G 5						
	Q 1						
Kobfjord							
Kong Karls L							
Kongsberg, 7,2							
Kongsvinger, 2							
Kopervik, 1,618	D 7						
Kornsjö	G 7						
Kragerö	F 7						
	F 8						
	E 5						
O 1							
Singsås	K 2						
Skagerrak (arm of sea)	E 8						
Skånevik	E 7						
Ski	D 4						
Skien, 14,744	F 7						
Björnöya (island)	D 3						
Bodö, 6,212	J 3						
Boknfjord	D 7						
Borge	H 2						
Bremangerland (island)	D 6						
Brevik, 2,419	F 7						
Brønnøysund, 1,273	G 4						
Bygland	F 7						
Davik	D 6						
Dombås							
Dovre	F 6						
Dovrefjeld (mts.)	F 5						
Eide	6						
Eidfjord	6						
Eidsfoss	6						
Eidsvoll	G 6						
Eina	G 6						
Elverum	G 6						
Fagernes	F 6						
Farsund, 1,498	E 7						
Longyearbyen	C 2						
Lopphavet (bay)	M 1						
Losna River	G 6						
Luster	E 6						
Lysaker	D 3						
Mageröy (island)	P 1						
Mandal, 3,385	E 7						
Mael	F 6						
Malhane	G 5						
Mosjøen, 2,001	H 4						
Moskenesöy (island)	H 3						
Moss, 17,008	D 4						
Mysen, 2,023	G 7						
Namsen River	H 4						
Namsos, 3,781	G 4						
Narvik, 10,233	K 2						
Naustdal	E 6						
Nittedal	D 3						
Nordautlandet (island)	D 1						
Nordfjord	E 6						
Nordkapp (cape)	P 1						
Nordkyn (cape)	Q 1						
Nordli	H 4						
Halden, 10,610	G						
Haltdalen	G						
Hamar, 10,177	G						
Hammerfest, 3,798	N 1						
Hardangerfjeld (mts.)	E						
Hardangerfjord	D						
Harstad, 4,211	D 6						
Hinlopen Strait	C 1						
Hinnöy (island)	K 2						
Hitra (island)	F 5						
Hjerkinn	F 5						
Hölen, 181	D 4						
Holmestrand, 1,870	C 4						
Holmsbu, 446	D 4						
Hönefoss, 3,203	C 3						
Hopen (island)	E 2						
Hornsund (bay)	C 2						
Horten, 10,775	D 4						
Hortensfjord	G 4						
Hosteland	D 6						
Isfjorden	B 2						
Kviteseid	F 7						
Laerdal	E 6						
Laksefjord	P 1						
Sandane							
151	K 2						
108,933	D 6						
	G 5						
	Q 1						





**NORWAY, SWEDEN,  
FINLAND AND DENMARK**

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SCALE OF MILES

SCALE OF KILOMETERS

- POPULATION SCALE**
- Over 100,000
  - 50,000 - 100,000
  - 25,000 - 50,000
  - 10,000 - 25,000
  - 5,000 - 10,000
  - Less than 5,000
- Capitals of Countries**
- Administrative Centers**
- Internal Boundaries**
- Canals**
- Railroads**

# NORWAY, SWEDEN, FINLAND AND DENMARK *Continued*

Skjåk	F 6	Avesta, 6,088	J 6	Kattegat (arm of sea)	G 8	Ramsjö	J 5
Skreia	G 6	Bålsta, 704	G 1	Kebnekaise (mt.)	L 3	Rättvik, 869	J 6
Skudeneshavn, 1,130	D 7	Bastuträsk, 522	L 4	Kil, 981	L 4	Reftele, 712	H 8
Skulderud	G 7	Berga, 730	J 8	Kilafors, 416	K 6	Rimbo, 658	L 7
Smelror	R 1	Bergsjö, 293	J 8	Kiruna, 10,655	L 3	Roma, 401	L 8
Smöla (island)	E 5	Bispgården, 298	J 5	Kisa, 1,614	J 7	Ronneby, 5,868	J 8
Snäsavatn (lake)	H 4	Böda	K 8	Klintehamn, 783	L 8	Säffe	H 7
Sogndal, 304	E 7	Boden, 7,724	K 8	Kolåsen	H 5	Sala, 8,043	K 7
Sognefjorden	D 6	Bollnäs, 1,628	K 6	Köping, 7,496	J 7	Saltoluokta	L 3
Solund	D 6	Borås, 51,453	H 8	Kopparberg, 2,018	J 7	Saltsjöbaden, 3,391	H 1
Son, 563	D 4	Borgholm, 2,036	K 8	Korpilombolo	N 3	Sandträsk, 248	M 3
Sörkapp (cape)	C 2	Borlänge, 19,169	J 6	Kosta, 784	J 8	Sandviken, 17,182	K 6
Sörøy (island)	N 1	Bräcke, 1,004	J 5	Kristianstad, 22,807	J 9	Särna, 1,154	H 6
Stalheim	E 6	Brunflo, 591	J 5	Kristinehamn, 10,236	H 7	Särö, 263	G 8
Stathelle, 570	F 7	Bureå, 1,784	M 4	Krylbo, 2,098	J 6	Säter, 2,243	J 6
Stavanger, 49,218	D 7	Burgsvik, 297	L 8	Kungälv, 3,298	G 8	Sävsjö, 2,213	J 8
Steinkjer, 2,789	G 4	Burträsk, 836	M 4	Kungsbacka, 2,365	G 8	Sigtuna, 1,337	H 1
Steinneset (cape)	E 2	Byske River	M 4	Laholm, 2,654	H 8	Simrishamn, 2,795	J 9
Stöa	H 6	Charlottenberg, 1,019	H 6	Lainio River	N 3	Skänninge, 1,786	J 7
Stor-Elvdal	G 6	Dannemora, 624	K 6	Landeryd, 339	H 8	Skånör med Falsterbo, 1,051	H 9
Stören	F 5	Deje, 2,476	H 7	Landskrona, 22,602	H 9	Skara, 7,364	H 7
Storfjorden	D 2	Djursholm, 6,139	H 1	Långsele, 718	K 5	Skellefte River	L 4
Storöya (island)	E 1	Dorotea, 797	K 4	Långshyttan, 2,197	K 6	Skellefteå, 10,257	M 4
Sunnfjord	D 6	Duved	H 5	Lappland (district)	M 2	Skövde, 15,736	H 7
Sveagrava	C 2	Ed, 514	H 7	Lärbro	L 8	Slussfors	K 4
Svelvik, 1,131	C 4	Edsbyn, 2,495	J 6	Laxå, 1,069	J 7	Söderhamn, 10,004	K 6
Svolvær, 3,018	J 2	Eksjö, 7,304	J 8	Leksand	H 1	Söderköping, 2,783	K 7
Talvik	N 2	Ekskogen	J 6	Lidingö, 12,769	J 6	Södertälje, 18,909	G 1
Tana	O 1	Emådalen	J 8	Lidköping, 12,733	H 7	Sollefteå, 3,229	K 5
Tanafjord	O 1	Emmaboda, 1,440	J 8	Limeforsen	H 6	Sölvesborg, 4,085	J 9
Tana River	P 1	Enköping, 6,403	G 1	Limmared, 923	H 8	Sorsele, 686	K 4
Thamshamn	F 5	Eskilstuna, 45,245	K 7	Lindesberg, 4,355	J 7	Stensele, 457	K 4
Tönsberg, 11,388	D 4	Estölv, 6,392	H 9	Linköping, 46,617	K 7	Stockholm (capital)	L 7
Treungen	F 7	Fagersta, 4,989	J 6	Ljungan, 280	L 8	654,864	L 7
Tromsö, 10,785	L 2	Falkenberg, 6,640	H 8	Ljunghy, 5,354	J 8	Storlien	H 5
Trondheim, 56,444	F 5	Falköping, 9,063	H 7	Ljusdal, 2,170	J 6	Storuman, 680	K 4
Trysil	H 6	Falun, 15,327	J 6	Ljusne, 3,882	K 6	Storuman (lake)	K 4
Tunnsjö (lake)	H 4	Färjestaden, 465	K 8	Lobonäs	J 6	Storvik, 1,750	K 6
Tvedestrand, 1,073	F 7	Fårö (island), 1,023	L 8	Löfvånger, 507	M 4	Strängnäs, 5,231	G 1
Tynset	G 5	Filipstad, 5,034	H 7	Ludvika, 6,722	J 6	Strömbacka, 234	K 6
Tyrfjord	C 3	Finspång, 6,375	J 7	Lule River	M 3	Strömstad, 2,983	G 7
Tynes	D 6	Fjällbacka, 708	G 7	Luleträsk (lake)	L 3	Strömsund, 1,062	K 5
Tyuvfjorden	D 2	Flen, 3,071	K 7	Luleå, 16,553	N 4	Sulitjelma (mt.)	K 3
Ullensvang	E 6	Fredrika, 439	L 4	Lund, 30,665	H 9	Sundbyberg, 13,708	G 1
Ulsberg	G 5	Frövi, 804	J 7	Lycksele, 1,947	L 4	Sundsvall, 20,074	K 5
Ulvik	E 6	Furusund	L 7	Lysekil, 5,256	G 7	Sunne, 1,840	H 7
Vadsö, 2,080	O 1	Gäddede, 432	J 4	Malmberget, 4,224	M 3	Svanstein	N 3
Vaeröy (island)	H 3	Gällivare, 2,153	M 3	Malmö, 167,885	H 9		J 5
Vägavatn (lake)	F 6	Gamleby, 535	K 8	Malung, 1,018	H 6	Syvsleback	H 6
Valle	E 7	Gävie, 40,988	K 6	Mariefred, 1,542	G 1	Tirnaby, 238	J 4
Vannöy (island)	L 1	Gimo, 695	K 6	Maristad, 6,507	H 7	Tidaholm, 4,532	J 7
Vanylven	D 5	Gnesta, 1,313	G 1	Marstrand, 1,237	G 8	Tierp, 1,636	K 6
Varangerfjord	O 1	Göta River	H 7	Mellansel, 273	L 5	Tillberga, 1,024	K 7
Vardö, 3,779	R 1	Göteborg, 296,289	G 8	Mellerud, 1,667	H 7	Torne River	M 3
Vega (island)	G 4	Gotland (island), 57,485	L 8	Mjölby, 6,120	J 7	Torneträsk (lake)	L 2
Vegafjord	G 4	Gotska Sandön (island), 24	L 7	Mölnådal, 17,124	H 8	Torsby, 1,045	H 6
Vesterålen (islands) 29,130	J 2	Grängesberg, 5,598	J 8	Möra, 1,678	J 6	Torsköll, 1,920	K 7
Vestfjorden	J 3	Gränna, 1,294	J 6	Morjärv, 231	N 3	Trnås, 7,516	J 7
Vest-Spitsbergen (island)	C 2	Gräsö (island), 1,040	L 6	Motala, 7,203	J 7	Trelleborg, 15,311	H 9
Vestvågøy (island)	H 3	Hagfors, 4,716	H 6	Muonio River	M 2	Trollhättan, 20,091	H 7
Vigrestad	D 7	Hällnäs, 538	L 4	Murjek, 420	M 3	Trosa, 1,041	K 7
Vik	E 6	Hallsberg, 3,003	J 7	Nässjö, 10,225	J 8	Tungelsta	H 1
Vikna (island)	G 4	Halmsstad, 30,364	H 8	Niemisel	N 3	Uddeålla, 18,408	G 7
Volda	E 5	Hälsingborg, 65,357	H 8	Nora, 2,927	J 7	Uddjaur (lake)	L 4
Voss	E 6	Haparanda, 2,690	N 4	Norrköping, 75,792	K 7	Ullared, 342	H 8
		Härnösand, 13,316	L 5	Norsundet, 1,630	K 6	Ulrichhamn, 6,378	H 8
		Hässelholm, 3,895	H 8	Norrållje, 5,177	L 7	Ulrikfors, 503	K 5
		Häverödal, 702	L 6	Norsjö, 832	L 4	Ume River	L 4
		Hede	H 5	Nybro, 5,535	J 8	Umeå, 14,948	M 5
		Hedemora, 4,342	K 6	Nyköping, 15,680	K 7	Umfors	J 4
		Hemse, 562	L 8	Nyknäshamn, 5,444	L 7	Uppsala, 44,686	L 7
		Hjo, 2,984	J 7	Ockelbo, 986	K 6	Vadstena, 2,954	J 7
		Höganäs, 6,634	H 8	Öland (island), 26,895	K 8	Vaggeryd, 1,584	J 8
		Holmsund, 3,320	M 5	Örebro, 58,590	J 7	Valdemarsvik, 2,858	K 7
		Hornslandet (peninsula)	K 6	Öregrund, 1,266	L 6	Vänern (lake)	H 7
		Hotagen	J 5	Örnö (island), 395	H 1	Vänersborg, 9,144	H 7
		Hoting, 383	K 4	Örnsköldsvik, 5,592	L 5	Vännäs, 1,903	L 5
		Hudiksvall, 7,352	K 6	Örrefors, 638	J 8	Vansbro, 1,404	H 6
		Hultsfred, 2,197	K 8	Örsa, 962	J 6	Varberg, 10,513	G 8
		Huskvarna, 9,325	J 8	Osby, 2,277	J 8	Värnamo, 5,608	J 8
		ärna, 757	G 1	Öskarshamn, 8,922	K 8	Västerås, 44,306	J 7
		ärpen, 1,124	H 5	Öster-Dal River	H 6	Väster-Dal River	H 6
		ärsvå, 346	K 6	Östersund, 19,055	J 5	Västervik, 13,263	K 8
		Jokkmokk, 1,210	L 3	Östhammar, 1,260	L 6	Vättern (lake)	J 7
		önköping, 39,171	H 8	Övertorneå	N 3	Vaxholm, 2,765	H 1
		örn, 840	M 4	Överum, 1,200	K 7	Växjö, 16,900	J 8
		Kalix River	N 3	Oxelösund, 3,043	K 7	Vetlanda, 4,290	J 8
		Källviksbrunn	K 8	Pajala, 1,136	N 3	Vilhelmina, 1,070	K 4
		Kalmar, 23,834	K 8	Pite River	M 4	Vimmerby, 4,052	J 8
		Kalmarsund (sound)	K 8	Piteå, 4,259	M 4	Vindel River	L 4
		Karesuando	M 2	Porjus, 1,144	M 3	Visby, 13,626	L 8
		Karlskoga, 26,114	J 7	Ragunda	J 5	Vislanda, 725	H 8
		Karlskrona, 32,341	K 8	Ramnäs, 674	K 7	Vojmsjön (lakes)	K 4
		Karlstad, 31,369	H 7	Ramsle	K 5	Ystad, 12,109	H 9
		Katrineholm, 12,038	K 7				

## SWEDEN

Abisko	L 2	Åhus, 2,032	J 9
Ålby, 1,164	J 5	Alingsås, 10,294	H 7
Ålmhult, 2,837	H 8	Älvålen, 972	J 6
Älvadal, 972	J 6	Älvesta, 2,772	J 8
Älvkärls, 479	K 6	Älvsbyn, 1,211	M 4
Älvsbyn, 1,211	M 4	Ämål, 7,081	H 7
Ämål, 7,081	H 7	Ämotfors, 684	H 7
Ängelholm, 6,097	H 8	Änge, 2,453	K 5
Ängelsberg, 380	K 6	Ängelholm, 6,097	H 8
Ängersman River	K 5	Änttis	N 3
Änttis	N 3	Ärborg, 5,210	J 7
Ärborg, 5,210	J 7	Äre, 447	H 5
Äre, 447	H 5	Ärjäng, 1,196	H 7
Ärjäng, 1,196	H 7	Ärvidsjaur, 1,340	L 4
Ärvidsjaur, 1,340	L 4	Ärvika, 14,477	H 7
Ärvika, 14,477	H 7	Asarna	J 5
Asarna	J 5	Åseda, 1,161	J 8
Åseda, 1,161	J 8	Åsele, 1,393	K 4
Åsele, 1,393	K 4	Åsersund, 2,152	J 7
Åsersund, 2,152	J 7	Åsnen (lake)	J 8

tinued on a smaller scale all through the Viking period (the 700's to the 900's). At that time Sweden was barred from the seas to the west. What is now western Sweden belonged to Denmark and Norway. So the Swedes turned toward the east. The Frisian merchants carried on trade through the Baltic Sea. Before written history began, Swedes had crossed this sea and colonized the shores of what are now Finland, Estonia, and Livonia. They founded cities and states all the way to the Black Sea. In time these states became completely Russian. Some Swedes went all the way to Constantinople and entered the service of the Greek emperor. But the Swedes who left Sweden kept up their language and their Nordic traditions through many generations.

**The Coming of Christianity.** The Vikings first came in contact with Western civilization as they traveled through foreign countries. They brought the new Christian faith home to their own country. The Viking expeditions lost much of their attractiveness after foreign cities and countries developed better defense methods. Christianity helped to weaken the Vikings' desire for bloody adventure. During the Middle Ages, a strong royal power developed as the protector of the new church.

**The New Kingdom.** In the 1200's, the *jarls*, who held an office something like that of a vice-regent, rose to power among the quarreling nobles of Sweden. In 1266 Jarl Birger managed to get his son elected king. This concentration of power in the king's hands brought new glory to the throne, but not for long. Sweden became a feudal country, and power was divided among the clergy and nobility. German merchants of the powerful Hanseatic League, which ruled the Baltic, founded cities in Sweden. These city members of the League also took some of the power from the Swedish ruler.

**The Royal Palace at Stockholm** is built in the style of a French château, modified for its Swedish surroundings. It was

With power divided in Sweden, the country was an easy victim for foreign rulers. In 1388 Queen Margaret, regent of Denmark and Norway, succeeded in being elected regent of Sweden as well. From 1397 the three countries were united by the Union of Kalmar. After 1397 the three countries were ruled by a Danish king. This meant foreign rule and even oppression for the Swedes. They revolted again and again. Finally, in 1521, their revolt was successful. The leader of the rebellion, Gustavus Vasa, was first proclaimed regent and then king of Sweden (1523). Sweden has been completely independent ever since that time.

**The Reformation.** In the early 1500's, many of the northern countries broke away from the Catholic Church. King Gustavus strengthened his uncertain power by breaking with the Pope and seizing the vast wealth of the Swedish Church. Gustavus was also successful in establishing his power over the unruly Danish-minded nobility. He checked the rebellious peasants and freed the country from the control of the Hanseatic League, which had monopolized all Sweden's trade. When Gustavus died in 1560, he left behind a country which had become the strongest power in northern Europe. For this reason, the Swedes consider Gustavus the founder of modern Sweden.

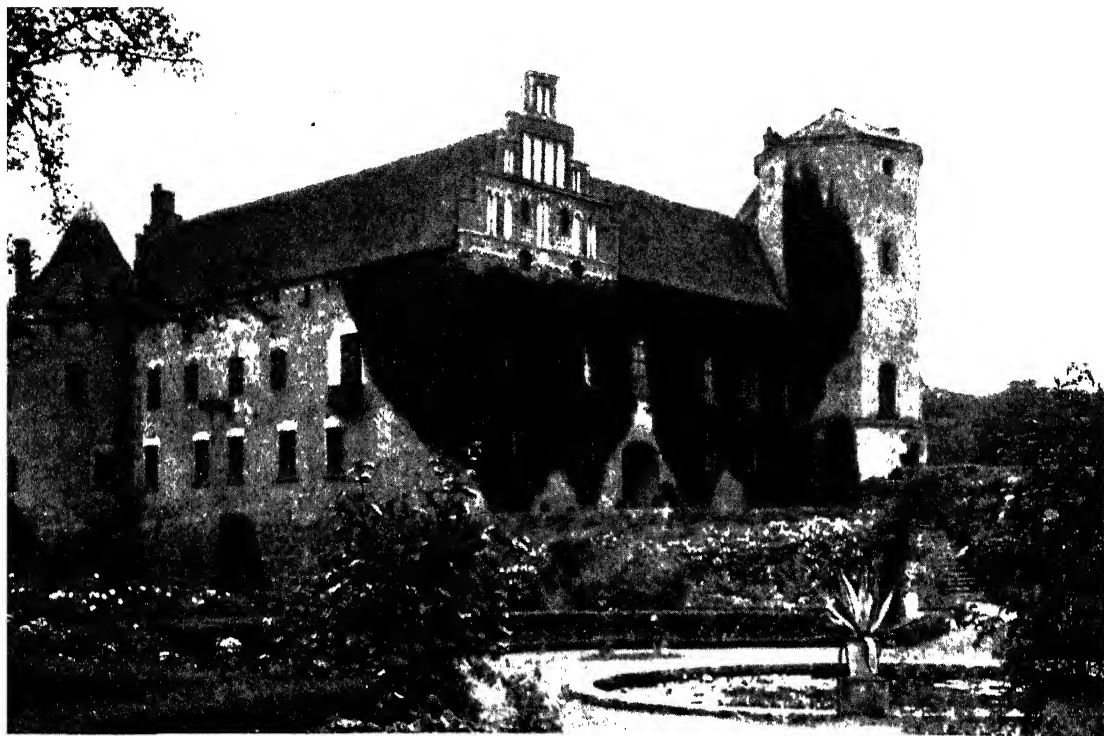
**Swedish Conquests.** In the next few hundred years, Sweden was involved in many wars against Denmark and Russia. Sweden wanted territory which would give the country an approach to the Atlantic and wanted to control the Baltic Sea as well. The Swedes managed to turn the Baltic into a "Swedish lake" by gaining possession of most of the shore regions. In 1659 and 1660 they took Scania and the other provinces which separated Sweden from the western seas.

Sweden's glory was great, but it did not last long. built in the late 1600's and houses a valuable art collection. The castle is surrounded by a spacious park.

Swedish Travel Information Bureau







Iron Galloway

### Torup Castle, Called the Most Beautiful Country Estate In Sweden

Between 1611 and 1718 the Swedish throne was occupied by three warrior kings who were also three of the greatest soldiers of their time. They were Gustavus II Adolphus, Charles X Gustavus, and Charles XII. These rulers won some of the greatest victories in modern history.

But Sweden was not able to keep its position as one of the leading world powers. In 1700 an alliance was formed by Denmark, Prussia, Poland-Saxony, and Russia. This alliance fought with Sweden until the country and its resources were exhausted. Sweden finally fell after the death of Charles XII, the "hero king," in 1718. The country lost most of its provinces in northern Germany and along the eastern shore of the Baltic. Sweden ceased to count as a great power.

**The Modern Period.** The death of Charles XII also brought the end of Swedish rule by all-powerful kings. Political power shifted into the hands of two classes, the lower nobility and the rich merchants. The parliament became the center of political life, and the foundations of Swedish parliamentary traditions were laid.

The 1700's were a prosperous time for trade, industry, literature, and art. But Sweden could not afford to spend much money or time on its army and navy. The country narrowly escaped sharing the fate of Poland, which was divided up by Russia, Austria, and Prussia. The Swedish parliamentary government took on dishonest ways. The people's discontent with this dishonesty made it possible for King Gustavus III to become absolute ruler once more. During this period of absolute monarchy, many economic and social reforms were introduced.

Sweden tried to remain outside the Napoleonic wars. But Russia and Denmark attacked Sweden, and Finland was lost in 1809. The Swedes tried to stay on good terms with Napoleon. They even elected one of his

nephews  
But once  
and finally  
defeated  
y to make

way

**History.** The political changes in Europe brought about a change in the government. The Riksdag became once more the political center of the country. In 1809 a modern two-system took the place of the old method which separated the nobility, clergy, burghers, and separate classes. Sweden slowly developed into a modern country. Hand in hand with this was a shift in power from the nobility to the middle and working classes. Gradually the vote was given to all citizens, and in 1920 the socialist leader Hjalmar Branting formed the cabinet in the first time. At that time, the labor movement, led by the Social Democrats, has through a great program of social legislation, managed to remain neutral during both World War I and II. During the Russo-Finnish war of 1939 and 1940, Sweden stayed neutral and the Finns. But after 1945, in attacking the Soviet Union, Sweden was brought into a neutral even toward Finland. Sweden was brought into almost all its trade

Sweden. But many of the people who fled from Germany found refuge in Sweden, which offered them shelter. — G.L.A.

Beskow, Elsa M.  
Bridget, Saint  
Ericsson, John  
Hedin, Sven Anders  
Lagerlöf, Selma  
Lind, Jenny  
Ling, Pehr Henrik  
Linnaeus, Carolus  
Nilsson, Christine

Nobel, Alfred B.  
Nordenskjöld, Nils A. E.,  
Baron  
Scheele, Karl Wilhelm  
Söderblom, Nathan  
Strindberg, August  
Tegnér, Esaias  
Tenggren, Gustaf  
Zorn, Anders Leonhard

## COASTAL WATERS

Baltic Sea  
Bothnia, Gulf of

Kattegat  
Skagerrak

## HISTORY

Battles, Fifteen Decisive  
(Poltava)  
Bernadotte, Jean Baptiste  
Jules  
Charles (IX, X, XI, XII)  
Christina

Denmark (History)  
Gustavus (I, II, III, IV)  
Norway (History)  
Oscar (I and II)  
Thirty Years' War

## UNCLASSIFIED

Clo-operative  
Doll (color plate)  
Dress (Sweden: color  
plate, Europe)  
Europe (color plate, Winter  
Resort at Åre, Sweden)  
Flag (color plate, Flags of  
Europe)  
Food (Favorite National  
Foods; Special Foods of  
Many Lands)

Glassware  
Housing (History of  
Housing)  
Krona  
Match (History)  
Stockholm  
Torne River  
Vänern

## Questions

What do the Swedes call their country? What does this name mean?

Why has the Swedish way of life been called "the middle way"?

What is Sweden's most important river? In what ways is it important?

What are Sweden's leading natural resources? How does Sweden compare in water-power resources with other European countries?

What peoples besides Swedes live in Sweden?

Who owns most of the farms in Sweden? What steps have been taken to improve farm lands?

In what part of Sweden is dairying important?

Where does the purest Swedish iron ore come from?

How has Sweden, with little or no coal, become a manufacturing nation? What products are manufactured?

What are co-operatives, and how important are they in Swedish life?

How does Sweden rank in telephone service with the rest of the world?

What sports do most Swedes enjoy?

**SWEDENBORG**, *SWÉ den bawrg*, or (in Swedish) *SWÉ den bawrg j'*, **EMANUEL** (1688-1772), was a Swedish scientist, inventor, and mystical religious leader. He was born in Stockholm, the son of a bishop and nobleman. Swedenborg studied at the University of Uppsala, as well as in other European schools, and became an authority on mathematics, astronomy, metallurgy, anatomy, and geology. He was named a member of the Swedish State Council of Mines and held this position most of his life. He devoted much of his spare time to preparing books on scientific studies. Swedenborg is credited with a number of inventions and drew plans for a submarine, an airship, and a magazine-type gun.

In his middle age, Swedenborg turned from science to religion. He wrote a number of books on religion,

setting forth what he called his "heavenly doctrines." He claimed that they were based on Bible teachings which had been interpreted to him through direct conversation with divine spirits. His strange views brought him much criticism.

His followers came almost entirely from his friends among the upper classes. Swedenborg did not intend to found a separate religious body, but soon after his death in London, some of his followers began to form churches founded on his views. These became known as the Churches of the New Jerusalem. W.W.S.

See also **SWEDENBORGIAN**.

**SWEDENBORGIAN**, *SWÉ-*



Brown Bros.

**Emanuel Swedenborg**, whose religious writings founded a new church

*den BAWR jih an*, is the name of a Christian body founded in London in 1787, which bases its doctrines on the teachings of Emanuel Swedenborg. It is more properly called "New Church" and "Church of the New Jerusalem." Its members believe that within the literal meaning of the Bible lies a spiritual sense which is unseen by ordinary men. They also believe that the second coming of Christ has already taken place. This coming occurred not in a personal sense, but through the spiritual meanings of the Bible as revealed by Swedenborg.

The first society in the United States was organized at Baltimore in 1792. A national organization was formed in 1817 under the name of the General Convention of the New Jerusalem. A split occurred in 1890, the seceding body taking the name of the General Church of the New Jerusalem. There are about 100 Swedenborgian churches in America, with a total membership of between 6,000 and 7,000. B.A.W.

See also **SWEDENBORG**, **EMANUEL**.

**SWEDISH NIGHTINGALE**. See **LIND**, **JENNY**.

**SWEeper**. See **CARPET SWEeper**.

**SWEET ALYSSUM**, *ah LIS um*, is a low, spreading plant that belongs to the mustard family. It bears clusters of tiny white flowers, and has four-sided stems which contain a bitter juice. It is a hardy plant and blooms until late in the fall. There are single and double varieties. Some are dwarfed, and others grow eight or ten inches high. See illustration on next page. A.C.Ho.

**Classification**. Sweet alyssum is *Lobularia maritima*; it belongs to the family *Cruciferae*.

**SWEET BASIL**. See **BASIL**.

**SWEET BAY**. See **BAY TREE**; **LAUREL**; **MAGNOLIA**.

**SWEET BIRCH**. See **BIRCH**.

**SWEETBREAD**. Young calves and lambs have a gland called the thymus gland in their throats. This gland is a choice kind of meat known as sweetbread. Lamb sweetbreads are too small to be sold in markets, but calf sweetbreads are considered a delicious meat dish. Butchers divide the gland into the throat sweetbread and the heart, or breast, sweetbread. Heart sweetbread is more tender and larger in size than throat sweet-

bread. Sweetbreads are best when they are taken from a young suckling calf, as the thymus gland gradually disappears after the animal feeds on grass. In France, animals are specially fed to develop large sweetbreads.

The pancreas of older calves is called stomach, or belly, sweetbread. It is much like the sweetbread of the thymus gland. J.A.B.

**SWEET BRIAR COLLEGE** is a privately supported, liberal arts college for women at Sweet Briar, Va. It offers courses leading to the B.A. degree. The honors plan of study is open to qualified students during their junior and senior years. Residence halls on the campus accommodate 440 students. Students may earn scholarships on their records, and earn part of their expenses by library, book-shop, and dining-room service. The college was founded in 1901. Average enrollment is about 450. M.G.

**SWEETBRIER.** See EGLANTINE.

**SWEET CASSAVA.** See CASSAVA.

**SWEET CHERRY.** See CHERRY.

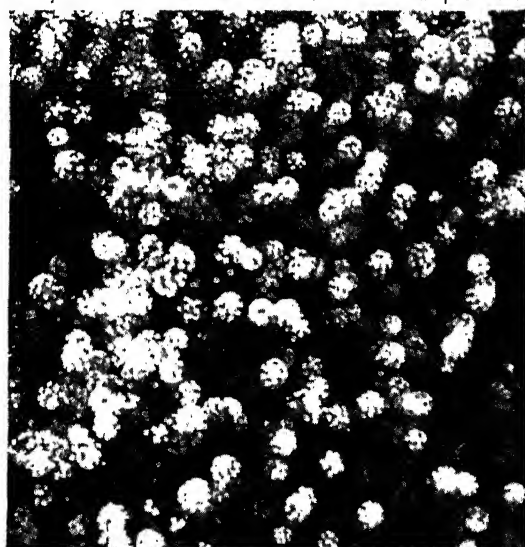
**SWEET CHERVIL, CHUR oil.** See CICELY.

**SWEET CICELY.** See CICELY.

**SWEET CLOVER.** See CLOVER.

**SWEET CORN.** The plant of sweet corn is smaller than field corn, and so are the ears. The kernels may be yellow or white. Sweet corn contains twice as much sugar as field corn, and is a good source of energy. It is a fairly good source of vitamins A and C. Sweet corn loses its quality rapidly after harvesting, and there is no way to sell it fresh at long distances from the corn belt. But the canning industry now makes it possible to sell canned sweet corn throughout the world. The center of the industry is just north of the corn belt. Minnesota, Wisconsin, northern Illinois, and Maine are the leading sweet corn-canning states. Sweet corn is also sold quick-frozen.

Sweet corn is grown exactly as field corn is. The seed is planted in thirty-six- to forty-two-inch rows, and in thirty-six-inch hills with three to five seeds per hill.



**Sweet Alyssum's Clusters of Tiny White Flowers** have kept it a long-time favorite for garden borders. W. Atlee Burpee Co.



J. Horace McFarland

**Sweet Corn** is often called a typical American food. Its high sugar content makes it both delicious and nourishing.

Sweet corn does best in rich well-drained soil kept warm by plenty of sun. If the soil is not rich, fertilizer should be used. The soil should be broken just before planting. Sweet corn is attacked by both the European corn borer and the corn-ear worm. There is no really effective control. Bacterial blight and Stewart's disease are the most serious diseases. Resistant varieties should be planted. Planting is begun after the last frost and continues for about six weeks. The corn must be picked at exactly the right time for the best flavor. It is best when the kernels are full of a milky fluid, and not so good after the kernels have hardened.

Until a few years ago the open pollinated varieties, such as Golden Bantam, Evergreen, and Country Gentleman, were raised. Nearly all the varieties now raised for canning or freezing are hybrids. Golden Cross Bantam is the leading variety. Some home gardeners, however, still prefer the open pollinated sorts. L.A.S.

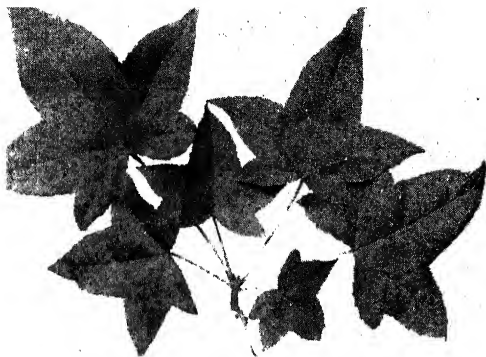
See also CORN-EAR WORM.

**Classification.** Sweet corn is *Zea mays*, var. *saccharina* in the *Gramineae* family.

**SWEET FLAG** is a tall reedlike plant of the arum family. It grows along brooks and in marshy places in almost all parts of the Northern Hemisphere. Its leaves are flat and two to six feet long. They are shaped like a two-edged sword. The stems of the sweet flag are almost like the leaves, but are stiffer and bear spikes of small green blossoms near the top. The leaves and stems arise directly from the tuberous underground rootstock. The rootstock is the calamus root used by druggists. It has value as a tonic, and is also used in the manufacture of perfume, hair powder, and other toilet preparations. In Europe the rootstock is sliced, sugared, and eaten like candy. H.N.M.

The sweet flag belongs to the family

**SWEET GUM, or RED GUM, TREE**, is a tall tree of North America that grows along the Atlantic Coast from New England to Florida, and westward to Oklahoma and Texas. It is a beautiful, stately tree, growing to an average height of 80 to 100 feet, with a straight trunk about three or four feet through at the base. Its slender branches form a shape somewhat like a pyramid. It has many deeply lobed leaves. In the North, the leaves turn a deep red in autumn, making the sweet gum one of



L. W. Brownell

Leaves of the Sweet Gum, or Red Gum, are among the most brilliant in autumn. The tree is tall and stately.

the most beautiful autumn trees. The sweet gum is often planted as an ornamental tree. Its wood is not strong, but is medium heavy, fairly hard, and close-grained. It is brownish with red tints, and is used for veneer, furniture, barrels, and pulp.

W. M. Har.

**Classification.** The sweet gum is classed as *Liquidambar styraciflua* in the *Hamamelidaceae* family.

**SWEETHEART.** See **INSECT** (color plate, Moths).

**SWEET PEA.** This favorite garden flower belongs to the same family as the kind of pea that we eat. The



L. W. Brownell

The Tall, Swordlike Sweet Flag, with its spikes of tiny blossoms, is a familiar sight along streams and in marshes.

sweet pea is grown for the beauty and delightful fragrance of its flowers. These flowers are colored blue, red, purple, pink, and white. Some persons think they look like butterflies. In some varieties of sweet peas, the flower petals are smooth and velvety. In others, they are crinkled and wavy.

Successful raising of sweet peas requires a rich, well-drained soil, plenty of sunshine, and free circulation of air. The seed should be sown in April, one ounce to thirty feet of row. The plants should be at least two inches apart in the row. The rows should be four feet apart. As soon as the plants appear above ground, the gardener should begin to cultivate the ground. The soil should be stirred lightly every week, preferably after a rain. The rows should be kept free of weeds. It is necessary to feed the plants once a week with a liquid fertilizer.

The vines should also be trained on strings. Wire trellises may absorb too much heat. The flowers should not be allowed to go to seed, but should be picked as they open.

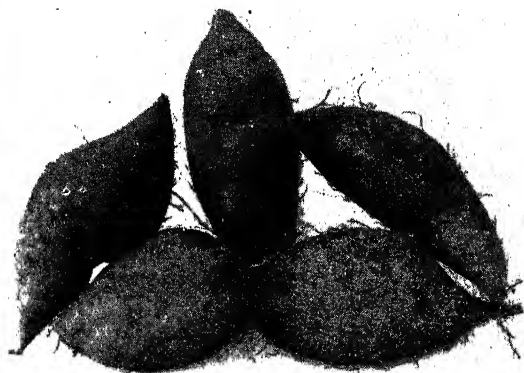
A. C. Ho.

See also **FLOWER** (color plate, Common Garden Flowers).

**Classification.** Sweet peas belong to the family *Leguminosae*. The common garden species is *Lathyrus odoratus*.

**SWEET POTATO.** The sweet potato is an annual vine related to the morning-glories. It produces fibrous roots which are a valuable food. The vines arise from the main stem and lie along the ground. Some varieties have pale green vines with small pointed leaves. Others have purple vines with large leaves. Some of the roots become very large and fleshy. Large specimens are often called *yams*, but the real yam is in a different family, and yams grow only in the tropics. Most sweet potatoes belong to one of two types. One of these is dry and grainy, like the Jersey Yellow. The other type is damp and very sweet, almost sirupy. Triumph is another popular dry potato, while the Porto Rico is juicy.

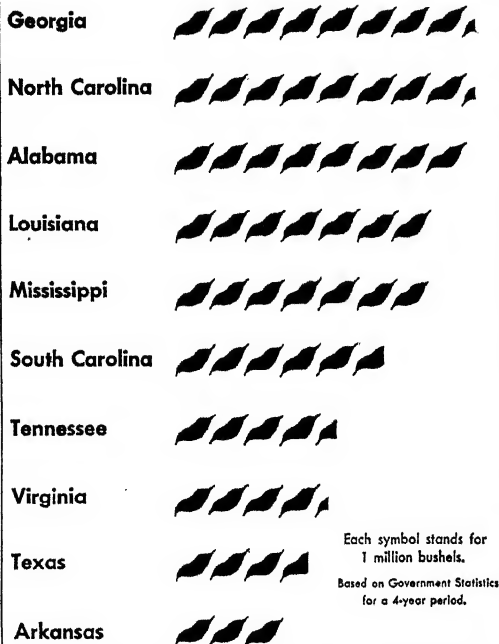
The sweet potato is very high in energy value. Only dry beans and peas yield more energy. Sweet potatoes also contain much vitamin A and a good amount of vitamin C. They are the most important commercial vegetables, except for the Irish potato. They are sometimes used to make starch and alcohol. The sweet po-



N. Y. Botanical Garden

The Toothsome Sweet Potato has long been associated with holiday feasts. It has great commercial importance.

### Ten Leading Sweet Potato States



tato first grew in tropical America. It was raised in Virginia as early as 1600. Louisiana, Tennessee, Virginia, and New Jersey, as well as Georgia, North Carolina, and Alabama, are among the leading states in sweet-potato production.

Sweet potatoes are grown from roots placed in moist, warm, sandy soil in greenhouses or hotbeds about four weeks before planting time. Buds just below the skin of the planted root produce new plants that grow up through the soil. These young plants are called slips. They are removed and planted in rows about thirty inches wide, with about eighteen inches between the rows. The rows are usually ridged to help the water drain. Some hoeing is necessary at first to control weeds, but soon the vines cover the entire surface.

Harvesting is best done before frost. The roots must be handled carefully to prevent bruising. They are cured, or dried, and then stored in relatively warm, dry places. Here they keep for several months.

A fusarium wilt called stem rot is a common ailment of sweet potatoes. The seed should be carefully examined to take out those from plants which are diseased. The rotation of crops also helps control the disease. Sweet potatoes have almost no insect enemies and are therefore easy to grow. L.A.S.

See also CARVER, GEORGE WASHINGTON; CONVULVULUS; YAM.

**Classification.** The sweet potato belongs to the *Convolvulaceae* family. Its scientific name is *Ipomoea batata*.

**SWEET WILLIAM** is one of the oldest garden flowers. It belongs to the pink family. The sweet William ranges in color from white to dark red and purple. The fringed velvety blossoms are crowded together in dense clusters

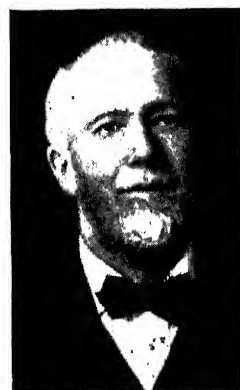
at the end of the stem. Each cluster may be of one color, or a single stem may contain flowers of different shades and markings. Sweet Williams grow readily from seed in ordinary garden soil. The plants are biennials and require two years to mature. Seedlings should be raised each year, to make sure of a continuous supply of flowers. They are particularly common and well-liked in old-fashioned gardens. See also FLOWER (Planting Table for Annual Flowers; color plate, Common Garden Flowers); PINK. A.C.Ho.

**Classification.** The sweet William belongs to the family *Caryophyllaceae*. Its botanical name is *Dianthus barbatus*.

**SWELLFISH.** See GLOBEFISH.

**SWIFT** is the name of a family of American industrialists who founded and developed one of the world's largest meat-packing companies. They helped turn the meat industry from merely a good industry into a vital part of American industrial life through the use of meat by-products.

**Gustavus Franklin Swift** (1839-1903) was born on Cape Cod, Massachusetts. When he was sixteen he wanted to leave home and start working, but his father offered him twenty dollars if he would postpone his adventure. With the money, Swift bought a calf, butchered it, and peddled the meat to neighbors.



**Gustavus Swift** founded a meat-packing empire.

Swift became an expert judge of cattle. He worked as a meat dealer and wholesaler, and finally went to Chicago where he became a partner in a meat-packing firm. The company expanded from one small building to more than fifty meat-packing plants with hundreds of wholesale houses, dairy, and poultry plants throughout the country. Swift established the practice of shipping meat in refrigerated cars and developed uses for animal by-products which had formerly been wasted. When he died he left a prosperous business to his sons, who continued the expansion of the company.

**Louis Franklin Swift** (1861-1937), oldest son of Gustavus Swift, became president of Swift and Company when his father died. With his brothers he established benefit plans for his employees and opened more new plants in many cities in the United States.

**Charles Henry Swift** (1872- ), second son of Gustavus, became chairman of the board of directors of the company. He was active in increasing the company's South American branches which made many meat shipments to Europe. These branches became Compania Swift Internacional with plants not only in South America but also in Australia and New Zealand.

**Gustavus Franklin Swift, Jr.** (1881-1943), youngest son of



**Gustavus Swift, Jr.**, was a leader in educational activities as well as business.



the founder of Swift and Company, served as president and director of the company. He was president of the board of trustees of the University of Chicago, a director of the United Charities of Chicago, and prominent in other educational activities. H.U.F.

**SWIFT.** The swift is a small bird with strong wings but weak feet. Various kinds of swifts are found in practically every part of the world. The swift is sooty brown or greenish black in color. Some swifts have



The Swift is one of the most graceful and tireless fliers. Because it lives entirely on insects it is among our most valuable birds.

white throats or rumps. Swifts fly tirelessly all day, capturing their insect food while on the wing. They seldom alight. At dusk they return to the chimney, cave, cliff, or hollow tree, where they live in colonies or roost in flocks. Their song, continuously repeated, is little more than chattering. Swifts build odd nests, in which sticks are cemented together with saliva. Some of these nests are almost entirely made up of saliva, as are the bird's nests of eastern Asia which people eat.

The common American swift is a bird of eastern North America. It lives almost entirely in chimneys. It is called *chimney swift*, or, wrongly, *chimney*. In perching, it clings to the wall with its feet, and braces itself with its spine-pointed tail. It breaks off the twigs for its nest with its beak or its feet as it flies. The nest is semicircular in form. It is firmly cemented to the inside walls of a chimney which is not used during the summer. The female lays four to six white eggs. Swifts are very useful birds. They eat almost nothing except insects.

See also BIRD (Kinds of Nests; Speed and Distance of Flight; Illustration, Unusual Nests); EDIBLE BIRD'S NEST.

**Classification.** The swifts make up the family *Micropodidae*. The chimney swift is *Chaetura pelagica*. There are about 150 different kinds of swifts throughout the world. Only about five swifts may be found south of Mexico.

**SWIFT** is the name of certain small lizards that are very active. Swifts live in the western part of North America, in Mexico, and in Central America. They live on dry land. Swifts can be recognized by their tiny scales with sharp points that often look like spines. There are about fifty different kinds of swifts. C.H.P.O.

**Classification.** The swift belongs to the family *Iguanidae* and the genera *Uta* and *Sceloporus*.

**SWIFT, JONATHAN** (1667-1745), was one of the greatest English satirists of all time. His works are noted for their bitterness. In one pamphlet, *A Modest Proposal For Preventing the Children of Poor People from Being a Burden to their Parents or the Country*, he ironically suggested that the children should be eaten, so as to supply food for the peasants and keep down the population. Swift's biting humor was so completely misunderstood that he was called an inhuman monster.

But today Swift is even more misunderstood. His greatest work, *Gulliver's Travels*, one of the most biting satires on human nature ever written, is widely looked on as a story for children. See GULLIVER'S TRAVELS.

Swift was born in Dublin, Ireland, into an English family. He was an unusually bright child and by the time he was five he could read any chapter in the Bible. Swift's father had died before the boy was born, and he was brought up by a miserly uncle. Swift attended the Kilkenny School and Trinity College in Dublin, where he was interested largely in history and poetry.

During the Revolution of 1688, Swift went to England and became the secretary of Sir William Temple. This position gave him an opportunity to do a great deal of studying and writing. In 1694 he left Temple's service and became a clergyman. Swift was sent to a small, quiet parish in Kilroot, near Dublin, but he was not satisfied here, and in 1696 returned to the Temple household. At this time he met a beautiful child, Esther Johnson, who was to play an important part in his life. Later he made her famous as the "Stella" of his writings.

In 1699 Temple died, and Swift returned to Ireland. For a time he served the Earl of Berkeley as secretary and chaplain. As a reward, he was made vicar of Laracor, Agher, and Rathbeggan. Swift had been engaged in political writing for some time, and in 1704 he won wide fame with the publication of his *Tale of a Tub*. This book was a humorous satire on insincerity in literature and religion. It injured his chances for advancement in the Church. He also wrote some satirical sketches under the pen name of Isaac Bickerstaff. In the years that followed Swift became a well-known figure in politics. He began as a Whig, but soon turned from this party entirely and in 1710 became editor of the Tory *Examiner* in London. In 1713 he returned to Dublin as dean of Saint Patrick's Cathedral.



**Jonathan Swift**, English clergyman and writer, whose satires on politics still make delightful reading

During his earlier stay in Ireland, Swift had urged Esther Johnson, now grown up, to make her home near his, and the two continued their friendship. From 1710 to 1713, while he was in England, he wrote the letters that make up the famous *Journal to Stella*. At the same time he became friendly with Esther Vanhomrigh,



"*Gulliver's Travels*" by Jonathan Swift tells of a shipwrecked Englishman who landed on an island where the people were 6 inches tall. He was captured and carried to town on a cart drawn by 1,500 horses. The King is telling Gulliver to put down the Town Crier or the archers will shoot.

whom he called "Vanessa." This affair caused him much embarrassment and had a tragic ending. The young lady followed him to Ireland and settled near him. She learned of his love for Esther, and wrote angrily to her for an explanation. Swift immediately broke off with Vanessa and the young lady died soon afterward.

In 1724, the year after this unfortunate affair, Swift won the love and respect of the Irish people by his *Draper Letters*. In these he opposed the making of copper coins in Ireland. Two years later he wrote *Gulliver's Travels*. He continued to write in defense of the Irish people until 1742, when he became mentally ill. He died three years later, and was buried in Saint Patrick's. G.E.B.

See also ENGLISH LITERATURE (The Age of Swift and Pope); SATIRE.

**SWIMMING** is a sport that is as old as the most ancient records of history. The book of Exodus in the Old Testament tells of Egyptians swimming and bathing in the Nile River. Carvings of the ruins of Pompeii show swimmers using a side stroke.

The first swimming associations were formed in Europe about 1862 to promote interest in swimming. The well-known crawl stroke was developed in Australia at the start of the 1900's. Hawaii is also known for its interest in swimming. One of its noted swimmers was Duke Kahanamoku, who was one of the first to use the modern leg stroke.

**How to Swim.** Two things must be learned before one should try to swim. They are learning how to breathe and how to stand up in water. Both steps should be mastered in shallow water.

Correct breathing is absolutely necessary in swimming. It should be practiced at first with the face out of the water, because the process is almost the opposite of natural breathing. Breathing is normally done without thinking of it. It is natural to overwork the lungs by breathing too deeply when one is conscious of taking a breath while swimming. This forced breathing tightens the chest and stomach muscles and quickly tires the body. Beginners should try to take a little less air into the lungs than they think they need. This will help to develop a normal breathing process while in the water. Breathing in, or inhalation, should always be done through the mouth while swimming. The breath can be exhaled through the mouth or nose, or both. Authorities differ on which method of exhalation is the best.

The beginner can learn to control his breathing by means of a simple exercise. Stand in water about waist deep with the feet placed about eighteen inches apart. Bend the body slightly forward, and place the hands on the knees. Take a normal breath through the mouth, close it, and slowly place the face in the water. Open the eyes and look at the objects at the bottom of the water. Hold your breath under water without straining as long as is comfortable. Then lift the face out of the water and exhale all the air slowly through the nose. Open the mouth and easily take the next breath. Place the face in the water and repeat the process. Do not breathe too deeply. Practice this operation until you can put your face in the water immediately after taking the breath. Then begin to speed up the exercise. Bob the face in and out of the water, exhaling through the nose under water, and inhaling through the mouth when the face is out of the water.

The next step follows right in line with the first exercise. Place the face in the water as before and hold the breath. Then slowly drop the hands from the knee to a point halfway between knee and ankle. Pull the feet off the bottom and bring the knees up to the chest. At first, it will feel like standing on your head or turning a somersault. Do not be alarmed. Further practice will make the movement seem natural. Keep the knees on the chest and the body will rise until the back floats free of the water. This shows that the body naturally floats in water.

You can put your feet on the bottom any time you want to. Place them down, but keep the hands in the water to maintain balance. In slow motion, this would mean loosening the grip on the legs and slowly straightening them until the feet touch the bottom. Lift the face from the water when you need a new breath of air. Continue the breathing process learned in the first exercise while practicing this movement.

In order to stand after lying in a prone position on the surface of the water, pull both knees to the chest as learned in the previous exercise. Draw up both knees at the same time. If one leg sticks out, it will act as a lever on the water and make it difficult for the swimmer to keep balanced.

Much of the early fear of the water will be overcome by learning to breathe and to stand. This will lead to a muscular limppness in the water which is known as relaxation. Relaxation is the secret of all good swimming.

# POPULAR SWIMMING STROKES

## BUTTERFLY BREAST STROKE



Arms are pulled from water and moved forward in quick action.

Arms strike water hard to begin powerful stroke toward waist.

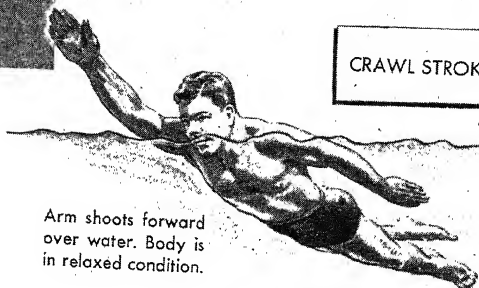


Frog Kick

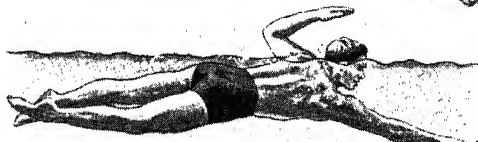
Head is held low as both arms pull body forward through water.



## CRAWL STROKE

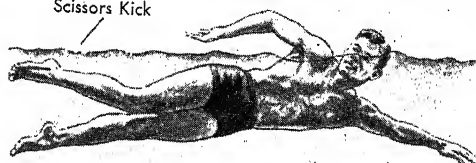


Arm shoots forward over water. Body is in relaxed condition.



Arm makes strong back stroke and other arm shoots ahead over water.

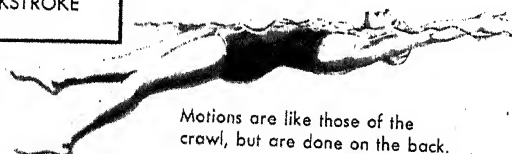
Scissors Kick



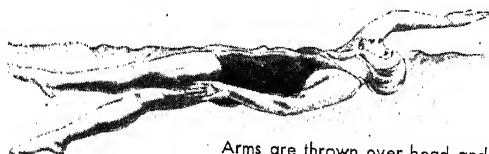
Swimmer gulps air through mouth as body rolls from side to side with alternate strokes of arms.



## BACKSTROKE



Motions are like those of the crawl, but are done on the back.

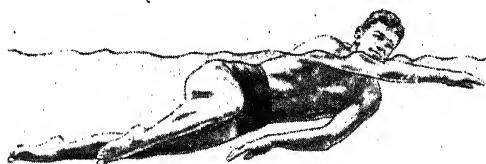


Arms are thrown over head and drawn back one after the other.

## DE STROKE



Body on left side, left arm makes pulling stroke. Arms are under water.



Upper leg kicks as lower leg swings back and forth.

## EAST STROKE

From Underside



Arms are drawn up into froglike position. Arms move forward together under water.

Legs kick out in wide arc at same time extended arms are brought backward sidewise.

**Swimming Strokes.** The beginner is now ready to learn to swim, or to move about in water over his head. The most natural movement is a popular stroke known as the *crawl stroke*. A person is at home in the water and can learn any of the other strokes quickly after mastering this simple stroke.

The leg stroke, or kick, is the most important part of the crawl stroke and should be learned first. Float face down in the water, with arms stretched over the



**Swimming the Crawl Stroke** requires muscular co-ordination and correct breathing. This swimmer is turning her head to take a breath which is expelled under water. Every time her left arm reaches out, she turns her head to breathe.

head and hands held together. Swing first one leg and then the other up and down from the hips. The knees and ankles should be loose and flexible. This easy, rhythmic thrashing motion will cause you to move forward slightly. The major force comes from the thigh. The kick should be only high enough to feel the knees pass each other. The force of the kick is upward. Do not draw up the knees, but allow them to bend slightly. You can not move if your legs are held rigid and still. The foot should be turned down, as you will move backward if the foot is turned up during the recovery.

The principle of the swimmer's kick can be more clearly shown out of the water. Stand on the toes of one foot and point the other foot down. The instep will then have the same form, or pitch, as a propeller blade. The propeller gets its pushing power from the pitch of the blade as it revolves. The pushing force in swimming comes from flipping the feet up and down. Shake the relaxed leg while still standing, and notice that the foot revolves as the propeller does. This motion is even greater in the water where there is more pressure against the foot than in the air.

Expert swimmers get much of their speed from the kick. Some swimmers can go as fast with their feet alone as other swimmers can go using both hands and feet. But no one can swim without difficulty for more than fifteen or twenty yards with the feet alone, because it is too tiring.

The beginning swimmer can get most of his power from his arms by using the crawl stroke. The feet are used to help balance the body and to provide as much push forward as the swimmer is capable of. The number of kicks used for each arm stroke depends on the physical strength of the individual.

In practicing the arm stroke, pull one arm down in a sweeping half circle. The stroke should be finished with the arm stretched down at the side and pointed towards

the feet. At the end of the stroke, relax the arm, raise it above the water, and swing it back to the starting point above the head. Another stroke should be started with the second arm before the stroke of the first arm is finished. One arm must swing over the water faster than the opposite arm pulls under the water.

Do not reach farther with either arm than you can reach with both arms held together. Overreaching tires the swimmer quickly and does not give him any additional power. There should be a slight feeling of coasting on the hand, at the beginning of each stroke. But the hand must be going into the stroke at the same time you feel the coasting feeling. Do not overreach at the surface of the water in trying to feel this coast.

There should be a slight natural roll to the body in order to swing the arms easily over the water. Most of this roll is above the hips. The underwater stroke should be timed so that the bottom of the stroke is reached when the side of the body nearest the arm is lowest in the water. The swimmer has a feeling of pushing himself over the water rather than of pulling himself through the water, when the strokes are properly timed.

In swimming the crawl, all breathing is done on one side or the other. Turn the head to the right at the time the left arm strikes the water. It may be necessary at first to raise the head slightly but avoid this if you can. Open the mouth and take in air. Then turn the face down into the water and exhale as the right arm does its stroke. Breathe out slowly, but exhale all the air. The swimmer will tire quickly and soon find it hard to breathe if all the air is not exhaled each time before a fresh breath is taken. The swimmer may learn to breathe by turning his head to the left and reversing the process. But he should do all of his breathing from one side or the other. The rhythm of the stroke is lost if the swimmer turns his head from side to side with each stroke.

**Other Swimming Strokes** can be learned easily after the beginner has mastered the water by swimming the crawl. The starting position for the *breast stroke* is the same as that for the crawl. Float face down, with arms extended and hands together. The feet are stretched out to the rear with the heels together. The arms move first, in three separate counts. At the count of *one*, push the arms out and back so that the palms press against the water. At the count of *two* bring the arms up so that the hands are in front of the face with the elbows thrust out to the sides. Return the arms to the starting position at the count of *three*.

The legs are also moved in three separate counts. The leg movement begins on the count of *two* of the arm stroke. At the count of *one* for the legs, draw them up with the heels together, knees thrust out to the sides. At the count of *two*, push the legs outward to both sides of the body. At the count of *three*, sweep the legs together, heels first. This is the movement that helps the arms propel the body forward. The arms remain in the starting position until the kick is completed.

A new adaptation of the standard breast stroke is the so-called "butterfly" stroke. It is an overarm style which propels the forward part of the body out of the water with each stroke. It accelerates speed in short-distance races but is very tiring.

In the *side stroke*, the body floats more on one side than in the breast stroke. The kick of the side stroke is also different from the frog kicks of the breast stroke. Draw up the knee of the upper leg, the one nearest the surface of the water. Thrust the leg out and forward with the foot turned down. Then draw the leg down with a snap to touch the lower leg on the instep. The lower leg is swung slightly backward as the upper leg is thrust out. The lower leg then swings forward to meet the upper leg as they are drawn together. This action should be like the closing of a pair of scissors.

In the side stroke the upper arm makes the same kind of movement as in the crawl. But the hand does not reach above the water at any time. The lower arm is also held under the water. It is used in a level position to balance the body. It is reached out as far as possible and then stroked downward and up to the thigh in one sweeping motion.

The *backstroke* is done while the swimmer floats on his back. The arms are moved in turn in an arc over the swimmer's head. The legs help to move the body forward by using the scissors kick.

The *Victory backstroke* was taught to soldiers and sailors during World War II. It was considered the best stroke to use under combat conditions. In the Victory backstroke, the swimmer lies on his back. The motions of the arms and legs are the same as those of the breast stroke. But they are moved at the same time rather than alternated as in the breast stroke. One great advantage in this stroke is that the swimmer's face is always clear of the water.

**Swimming as a Competitive Sport** was included in the Olympic Games of 1896. For many years, English, Australian, and American swimmers held all the swimming championships in these games. But in 1932 the Japanese team surprised the sporting world by turning in some amazingly good swimming records. In 1936, stars from many nations won swimming championships at the Olympic Games in Berlin.

Americans became interested in swimming as a sport about 1900. It has had a rapid development since that time. Most of the interest in early swimming was in the long-distance and marathon events. One of the most popular courses was the English Channel. Another long-distance test was the Wrigley swim from Los Angeles to Catalina Island. The Wrigley swim was later moved to Lake Ontario. But it was discontinued as shorter distances for swimming races became more and more popular.

The standard set of swimming distances for racing are those of 50, 100, 220, 440, and 880 yards, and one mile. The Olympic distances for men swimming free style are 100, 400, and 1,500 meters. The course for the breast stroke is 200 and 400 meters. The Olympic distances for women swimming free style are 100, 300, and 400 meters. The distance for the backstroke is 100 meters, and for the breast stroke is 200 meters. The medley for men is 800 meters, and for women, 400 meters. The medley is a race in which all three standard methods of swimming are used, the free style, the backstroke, and the breast stroke.

**American Swimming Champions.** One of the first great American swimmers was Johnny Weismuller,

who set many world records in the free style. Other American swimmers who held world records in the free style are Peter Flick, Jack Medica, Bill Smith, Ralph Flanagan, and Alan Ford. George Kojac, Albert Van de Waghe, and Harry Holiday became noted for swimming the backstroke. Walter Spence, Leonard Spence, R. R. Hough, and Jack Kalsey are well known as champions in the breast stroke. Adolph Kiefer is probably the greatest backstroke swimmer the sport has ever known. He was defeated in only one race over a period of eight years, from 1935 to 1943. That defeat came from Harry Holiday.

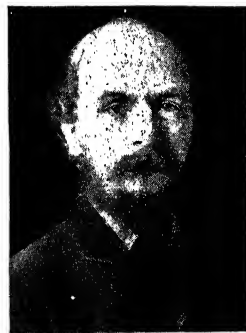
Famous women champions include the names of Ethelda Bleibtrey, Katherine Rawls, Eleanor Holm, Jarrett Rose, Ann Curtis, and Esther Williams. Helene Madison is considered the greatest of women free stylists.

After World War I, the interest in recreational swimming grew rapidly. Public beaches and pools were built in all parts of the country. The American Red Cross played an important part in interesting the general public in the sport. They trained lifeguards and held many classes in swimming so that people would lose their natural fear of the water. Swimming became known as an excellent body-building sport, as well as a possible means of saving one's life. It is also a valuable recreational activity because it provides relaxation for mind and muscle.

E.D.M.

See also DIVING; FARMING AND FARM LIFE (color plate, Old Swimming Hole); HOBBY (Books about Hobbies); POLO (Water Polo); SAFETY (Safety in the Water).

**SWINBURNE, ALGERNON CHARLES** (1837-1909), was an English lyric poet of the Pre-Raphaelite move-



Brown Bros.

**Algernon Swinburne** shocked England of the 1800's with his paganistic poetry.

ment. His was the spirit of rebellious youth, and he wrote recklessly of strange sins and passions. His book *Poems and Ballads* shocked the people of his time because of its pagan attitude toward morality.

Swinburne had a great gift for making music of words, and his verse is a series of flowing melodies. He was able to imitate the rhythms of Greek poetry. His *Atalanta in Calydon*, a classical drama with choral passages, is the closest to the Greek style that any modern poet has approached.

Swinburne was born in London of a noble family. He was educated at Eton College and Oxford University, but did not complete his course. Before he was twenty-two he published *The Queen Mother* and *Rosamund*, both fashioned after the Elizabethan drama. These plays, although they attracted little attention, were remarkable for so young a poet.

In 1861 he settled in London and became one of the Pre-Raphaelites. Four years later Swinburne published *Atalanta in Calydon*. It made him famous almost overnight. *Poems and Ballads* appeared the next year, and a number of political songs and odes followed.

As a result of a dissipated life in London, his health



began to fail. In 1879 Theodore Watts-Dunton, a friend, took him under his care. They settled in Putney and lived quietly and restfully together for thirty years. Strangely enough, Swinburne never wrote anything of worth after he reformed. L.U.

**His Works** include *A Song of Italy*; *Songs Before Sunrise*; *Erechtheus*; *Tristram of Lyonesse*; *Chastelard*; *Bothwell*; and *Mary Stuart*.

**SWINE.** See HOG.

**SWING.** See PLAY (illustration); PLAYGROUND.

**SWING** (rhythm). See DANCING (Development of the Dance [the 1900's]); POPULAR MUSIC.

**SWINNERTON, FRANK ARTHUR** (1884- ), is an English novelist. His books are written in a hushed, realistic tone, and tell of the dreariness of lower middle-class life in London. Swinnerton was born in a suburb of London. At the age of eight he had to leave school because of his poor health. At fourteen he began work in a publishing firm as a proofreader. His first novel, which he wrote at the age of twenty-three, was a failure, but it won him the position of editor in his firm. In 1917 his short novel *Nocturne* brought him wide fame. He then devoted all his time to writing. L.J.

**His Works** include *September*; *Young Felix*; *Coquette*; and *The Two Wives*.

**SWISS** is a fine, sheer cotton material which was first made in Switzerland. The fabric may be plain, figured, or may have woven or paste dots. Swiss which is made by the Heberlein process remains crisp and stiff after washing. Swiss is used to make dresses, aprons, and curtains. It comes in widths of 28 inches, 32 inches, and 36 inches for dresses and aprons. Curtain swiss comes in 36-inch to 40-inch widths. G.G.Dr.

**SWISS CHARD** is a common garden plant. Its stem and leaves are eaten as vegetables. Swiss chard is a variety of the common beet plant, which it resembles except that it does not have a large fleshy root. The root of the Swiss chard is small and woody and cannot be

eaten. The stems of the Swiss chard are fleshy, and the leaves are large and dark green in color. Some varieties of Swiss chard have pale yellow leaves and others have bright red leaves and stems. The plant is very attractive in appearance because of its brilliant colors and thick growth.

Swiss chard is one of the few edible garden plants that grow constantly throughout the summer. The seeds of the Swiss chard are sowed in the spring. The larger leaves are then harvested as soon as they develop. Later the more central leaves are taken, and the harvest continues until the plant is killed by frost.

Swiss chard was grown as far back as 350 B.C. It is a favorite crop in Switzerland and was introduced in the United States in 1806. Massachusetts is one of the leading states in the growing of Swiss chard.

Swiss chard has a great deal of food value. It is an excellent source of vitamin A and contains a fair amount of vitamins B and C. Like most leafy vegetables, Swiss chard is also rich in minerals. L.A.S.

See also PLANT (color plate, Vegetables Unknown to Our Forefathers).

**Classification.** Swiss chard is a variety of the species *Beta vulgaris*.

**SWISS GUARDS.** This famous body of Swiss soldiers grew out of a group of 250 Swiss who were picked to guard the Pope in the late 1400's. In the early 1500's Pope Julius II secured the position of the Swiss Guards by a treaty with cantons of Zurich and Lucerne. According to the terms of the agreement, the cantons undertook to supply 250 men to serve as bodyguard for the Pope from that time on. Since then the Pope has always had a body of Swiss Guards around him at the Vatican. But through the years, the number of guards has been reduced and their type of service changed. Today, they are called the Papal Swiss Guard.

Another body of Swiss soldiers, called Swiss Guards, or Switzers, was organized in 1616 to protect King Louis XIII of France. These soldiers served France for 175 years. On August 10, 1792, during the French Revolution, most of them were killed while defending the royal palace in Paris from attack by an angry mob.

The memory of these Swiss Guards is preserved in the famous "Lion of Lucerne," which is carved in the face of a rock at Lucerne, Switzerland. This monument bears the words, "To the Fidelity and Courage of the Helvetians."

In 1815 a second corps of Swiss Guards was formed by King Louis XVIII. These were defeated in the Revolution of 1830, and the corps was broken up. R.Co.

See also EUROPE (color plate, Swiss Guards at Rome).

**SWITCH, ELECTRIC.** See ELECTRIC SWITCH.

**SWITCHBOARD.** See TELEPHONE.

**SWITHUN, or SWITHIN, SAINT,** was a bishop of Winchester, England. He was a faithful adviser to Egbert, King of the West Saxons in the A.D. 800's. Swithun died in 862 and was canonized in the 900's. St. Swithun's Day is July 15. According to an old rhyme, if the weather is fair that day, it will be fair for the next forty days. If it rains July 15, it will rain each day for the following forty days. The origin of the rhyme is not known, and the weather prediction is meaningless. See also SAINT SWITHIN'S DAY. F.J.S.



Shiny Leaves of Swiss Chard have an attractive appearance in the garden. The plant is hardy and nutritious.

# SWITZERLAND



Haller, Sw

**SWITZERLAND** is a little country high in Europe's Alps. It is famous as the world's model republic and as a land of beautiful scenery. Switzerland's high white mountains look down on its green valleys and fields and its clear blue glimmering lakes.

The Swiss people are in no way united by race, language, or religion. They represent all the important physical types of people found in Europe. There is no national Swiss language. The Swiss speak different dialects of German, French, and Italian. But the Swiss people are not troubled by the fact that they may be descended from Germans, Frenchmen, or Italians. They think it is much more important that they are citizens of Switzerland.

The Swiss have really made democracy work. They have not had to borrow or imitate foreign governments. They planned their own constitution. The people have

worked together to build one of the most progressive governments in the world. Switzerland is one of the oldest and best-established countries in Europe. It has governed itself for almost seven hundred years, and has been completely independent for about three hundred years.

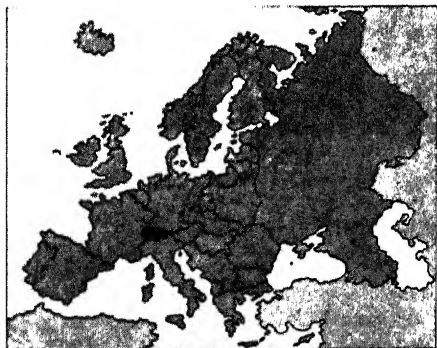
Switzerland has stood as an island of peace among the strong currents of the wars its neighbors have fought. The sturdy Swiss have defended their liberty against many ambitious tyrants, but they have been at peace with the world since the days of Napoleon. For more than a hundred years, Switzerland has served as a place of refuge for political leaders who have fled from the wars and revolutions of Europe.

## The Land and Its Resources

**Extent:** Area, 15,944 square miles (3,400 of which are glaciers, water, and eternal snows). *Greatest length*, 226 miles; *greatest width*, 137 miles.

**Physical Features:** *Chief mountain ranges*, Alps, Jura. *Chief peaks*, Monte Rosa, Matterhorn, Jungfrau, St. Gotthard group, Mont Blanc. *Elevation*, highest, Dufour Peak of Monte Rosa, 15,217 feet; lowest, shore of Lake Maggiore, 650 feet above sea level. *Chief rivers*, Rhine, Rhône, Inn, Aare, Ticino, Limmat, Reuss, Tessin. *Chief lakes*, Maggiore, Zurich, Zug, Lugano, Walensee, Brienz, Thun, Lucerne, Geneva, Constance, Neuchâtel. *Chief waterfalls*, Staubbach, Handeck, Pissevache, Reichenbach, Schaffhausen.

**Location, Size, and Surface Features.** Switzerland is



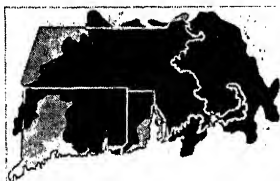
Location Map of Switzerland

## Pronunciation Guide

Brienz	bre	ENTS	Pissevache	pees	VAHCH
Handeck	HAHN	dek	Reichenbach	RI	ken bahk
Hofkirche	half	KIRCH	Schaffhausen	SHAHF	HOU sen
Jungfrau	YOONG	frou	Thun	toon	

only about half as large as the state of Maine. It is almost surrounded by Germany, France, and Italy. For the boundaries of Switzerland, see the colored map.

Switzerland is the most mountainous country in Europe. The snow-clad Alps and the Jura range cover about three fourths of the land. The highest mountains of the Alps make up the southern and central sections of Switzerland. The Jura Mountains form a great curve in the northwestern part of the country. A high plain lies between these two mountain ranges. Most of the people of Switzerland live on this plain.



The Area of Switzerland compared with that of Massachusetts, Connecticut, and Rhode Island

There are no very high peaks in the Swiss Juras. The highest point is Mt. Dole, which is a little over 5,500 feet above sea level. But the glacier-bordered Alpine ranges send up many towering peaks. The highest of these are the Monte Rosa, the Matterhorn of solid rock, and the Jungfrau. The Saint Gotthard group of mountains is the center of the great Alpine ranges.

**Rivers, Waterfalls, and Lakes.** Four of the greatest rivers of Europe make their way through Switzerland into four different seas. The mighty Rhine, which is made up of the Vorder-Rhein and the Hinter-Rhein, flows through Lake Constance. After it leaves the lake, it flows on to form the northern border of Switzerland. It turns at Basel, and finally empties into the North Sea. The Aare is a branch of the Rhine, and the chief river of western Switzerland. The Rhône River rises in the great Rhône Glacier. It gathers the waters of a number of swift mountain streams, widens to form Lake Geneva, and finally flows down to the Mediterranean Sea. The Ticino river finds its way from the southern slopes of Saint Gotthard eastward across the Po valley into the Adriatic. The River Inn drains into the Danube, and finally reaches the Black Sea.

In the springtime the melting mountain snows form foaming white torrents which rush into the valleys. Switzerland is famous for its waterfalls. The highest waterfall is Staubbach (980 feet), which spills down into the Lauterbrunnen Valley. The Handegg, near the beginning of the Aare, falls 240 feet. The Pissevache waterfall, in the Rhône valley, is almost as high. The Reichenbach is really a series of seven falls. The Giessbach descends in thirteen separate falls. The waterfall of the Rhine at Schaffhausen is only eighty-two feet high, but carries an enormous amount of water. There are over a thousand glaciers in Switzerland.

The surface of Switzerland gleams with shining lakes. The country has twenty-two large lakes. Some of the most famous of these are described under their own titles in THE WORLD BOOK ENCYCLOPEDIA. These include lakes Constance, Geneva, Lucerne, and Lugano. Two other famous lakes are described below:

**Neuchâtel**, *nyoo shahf TEL*, is the third largest lake in Switzerland, and the largest of those which lie entirely inside the country. This lake is twenty-four miles long, and covers an area of about ninety-two square miles.

Several rivers flow into the lake. Lake Neuchâtel is really a widened part of the Thielle River, which flows through it in a northeasterly direction. The lake has much historic interest because it was once the home of a tribe of ancient lake dwellers.

A number of towns and villages are built along its shores. Neuchâtel is the most important of these. There are also attractive forests and vineyard slopes along the lake shore, but some parts of the shore are low and swampy.

**Zurich**, *ZOOR ik*. This lake lies in the midst of the most charming scenery of northern Switzerland. It is shaped like a half moon. The lake is about twenty-five miles long, but only from one-half to two-and-a-half miles wide. A graceful bridge crosses the lake. Lake Zurich is a favorite tourist resort, and has a number of great hotels.

**Climate.** The height of the land in Switzerland varies greatly. This difference in altitude causes great differences in climate. But the climate throughout Switzerland is healthful, and the country has many health resorts.

There is an average annual rainfall of thirty-three inches on the central plain. The rainfall is much greater in the higher regions. Switzerland has a remarkable prevailing wind which the Swiss call the *fohn*. It is a hot, dry, southwest or south wind, which blows most frequently during the springtime.

**Natural Resources.** Switzerland has deposits of salt, iron ore, and manganese in the province of St. Gall. But the country is not rich in minerals. The Swiss have made up for their lack of coal by harnessing their mighty waterfalls to produce electric power. The Swiss call this power their "white coal." The country produces more electric power than any other area of the same size in Europe.

Switzerland's magnificent scenery is one of its greatest natural resources. It provides the little republic with a never-failing source of income. The country has valuable forests. Beeches, oaks, pines, and fir trees grow in the valleys and on the lower mountain slopes. Tiny white edelweiss blossoms dot the green fields and slopes of Switzerland in the spring. The edelweiss blossom is Switzerland's national flower.

Wild animals are no longer common in Switzerland, although the chamois and ibex are still found high up in the mountains. Grouse, partridge, and snipe are the chief game birds.

**Conservation.** Switzerland has many landslides and avalanches, especially in the Alpine regions. The great damage done by natural forces caused the Swiss Government to take an early and serious interest in conservation. The first efforts were directed toward the building of embankments and the control of mountain torrents. The government also supervised the cutting of timber and the planting of new trees to hold the soil in place.

In 1875 an agency called the "Federal Inspectorate of Forests" was set up to supervise flood control and reforestation. This agency later was given control of hunting and fishing. The first federal law on water control was put into effect in 1876. In 1902 this law was followed by a new law which is still in effect.

The first federal law on the subject of erosion, or the washing away of land, was passed in 1877. Other federal



Meerkümpfer, Swiss Federal Railroads

**The Majestic Matterhorn Beckons** to three mountain climbers on their way to scale the perilous, rocky peak. The mountain

defied man's efforts to conquer it for many years, but now mountaineers scale it in comparative safety.

laws which dealt with the promotion of land improvement (1884), and the promotion of agriculture (1893) were also put into effect. A large number of related erosion control measures have been carried out since, under the provisions of these laws.

The Government has also worked for better drainage, irrigation, rural road building, the piping of drinking water, and urban electrification. In addition, the Swiss Government has built houses for shepherds and sheds for cattle, installed aerial railways to carry people from mountain to mountain, and redistributed land among the people in order to secure better farming.

In 1875 a federal law was passed to protect useful bird life and to preserve the wild animals left in the mountains. This law was revised in 1904 and again in 1925. Today Switzerland has a broad conservation program.

The development of hydroelectric power started in 1908, when the Swiss constitution was amended to provide for "the utilization of hydraulic power under supervision of the Confederation." A Federal Office of Electric Economy was set up to carry out the government's electric power program.

#### The People and Their Work

**Population:** 4,265,703. **Density,** 268 persons per square mile. **Distribution,** rural, 67.2 per cent; urban, 32.7 per cent.

**Chief Products:** *Agricultural,* dairy products, cattle, pigs, fruit, poultry, tobacco, wheat, rye, oats, potatoes. *Mineral,* salt, iron ore, manganese. *Manufactures,* watches,

clocks, toys and other carved wood products, textiles, matches, chemicals.

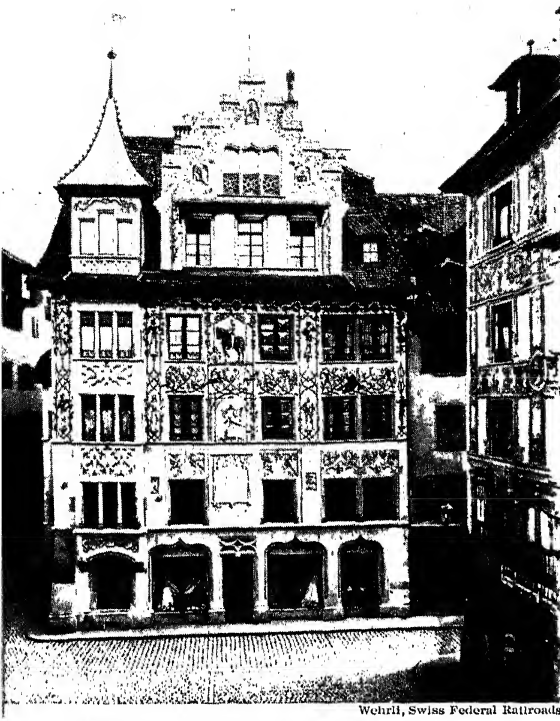
**The People.** Most of the Swiss trace their ancestry to Latin or Teutonic peoples. The majority are of Teutonic, or German, descent. About two thirds of the Swiss People speak some form of German. The rest speak French, Italian, or various other languages. In part of the canton of Grisons, the people speak an old Latin dialect called *Romansh*, or *Romansch*.

Many foreign travelers bring their own languages to the cities and mountain resorts of Switzerland. Generally about one Swiss resident out of every twelve is foreign-born. This is a much higher percentage of foreign-born residents than most countries have. The percentage is about equal to that of the United States.

The Swiss are strong and healthy, and their country is one of the cleanest in Europe. For hundreds of years, the Swiss have been known for their love of liberty. Their thrift has made them prosperous in a land which has many natural disadvantages.

**Agriculture.** About three fourths of the land in Switzerland is classed as "productive." But only about one sixth is actually planted in crops. The rest is in pastures and forests. Olives and other southern products and a great deal of timber grow in the valleys and on the lower mountain slopes. Pastures and fields of rhododendron are found higher up on the mountains. The Swiss must depend largely upon other countries for their supplies of grain. The hilly Swiss land is better suited to dairy farm-

## SWITZERLAND



Designs and Pictures decorate the front of the Dornacherhaus, one of the many painted houses in old Lucerne.

ing and to the pasturing of herds than to grain-growing.

The country is so wildly mountainous that farming is often very difficult. Many farms are perched on steep hillsides, where earthworks and stone walls have been built to keep dreaded avalanches from sweeping away or burying the houses and farms. Quaint cottage farm houses, or *chalets*, built of white-painted wood or rough gray stone, make the countryside attractive.

**Manufactures.** The lack of coal, oil, and iron is a serious drawback to industry. But the Swiss have developed some important manufactures. Seventy-seven per cent of Swiss workers are engaged in industry. For hundreds of years Swiss watchmakers have made the fine Swiss watches that are famous throughout the world for their delicate, precise workmanship. Leather-aproned Swiss woodworkers carve toys for the children of many countries. Swiss music boxes in their hand-carved wooden cases tinkle their merry tunes in many parts of the world. The first zipper and the first bouillon cube were made in Switzerland. The Swiss also manufacture lace, ribbons, clocks, jewelry, leather goods, and candy.

**Tourist Trade** is the biggest industry in Switzerland. Visitors from many parts of the world come to see the magnificent scenery, and to enjoy the healthful climate and the splendid winter sports. Switzerland is sometimes called the Playground of Europe. The discovery that tuberculosis could be cured in dry, cold, clear air has been one reason for the tremendous development of health resorts in Switzerland.

Sanitariums have been built in many parts of the country. The hot springs and the salt and mineral baths in Berne, Baden, and Schaffhausen attract many health seekers. Hotel-keeping has become a national profession. Professional guides help tourists climb the Alps, with ropes and stout metal-tipped poles called alpenstocks. Guiding tourists is regarded as a highly respectable pro-

fession, which is often handed down from father to son.

**Transportation and Trade.** Switzerland's income depends largely on its exports. The country must import much of its food. Trade routes are especially important to Switzerland for these reasons.

There are several main trade routes. One of these is the overland traffic route through France to Le Havre and the French Atlantic ports. Another is the Rhine river route to Rotterdam and across the channel to London. Others include the railroad and canal routes through Gernany to Hamburg and Bremen, and the overland route eastward to the Danube countries and the Near East. Trade also passes through the great Alpine tunnels, the Saint Gotthard and the Simplon, to Italy and on to Greece, Turkey, and Egypt. (See SAINT GOTTHARD.) The Saint Gotthard railroad route is the main north-south line inside Switzerland. The main east-west railroad route passes through Zurich and links Paris and Vienna.

The Swiss Government owns and operates about half of the country's railroads. There are 3,245 miles of railroads in Switzerland. Most of the trains run by electric power. A network of 10,200 miles of highways is always kept in excellent condition. A Swiss merchant marine of eleven vessels was authorized by the federal government in 1942. A government air line is also being developed.

**Communication.** The Swiss telephone and telegraph systems are owned and operated by the federal government. These services are extremely modern and complete. The telephone company will even keep records of telephone calls for customers who are on vacation. In 1946 the Swiss perfected an automatic device which makes records of telephone calls for persons not at home to receive them. The device plays back the recorded conversation when the person is ready to listen.

Switzerland does not have any large, privately owned radio broadcasting companies. The three major stations are owned by the federal government and operated for the government by the Swiss Postal Administration. The Post Office Department also operates a speedy delivery system to the most out-of-the-way sections.

Switzerland has many excellent newspapers and other publications. The best known of these is the *Neue Zürcher Zeitung*, or *New Zurich Newspaper*. Switzerland has the largest newspaper circulation in proportion to its population of any country in the world.

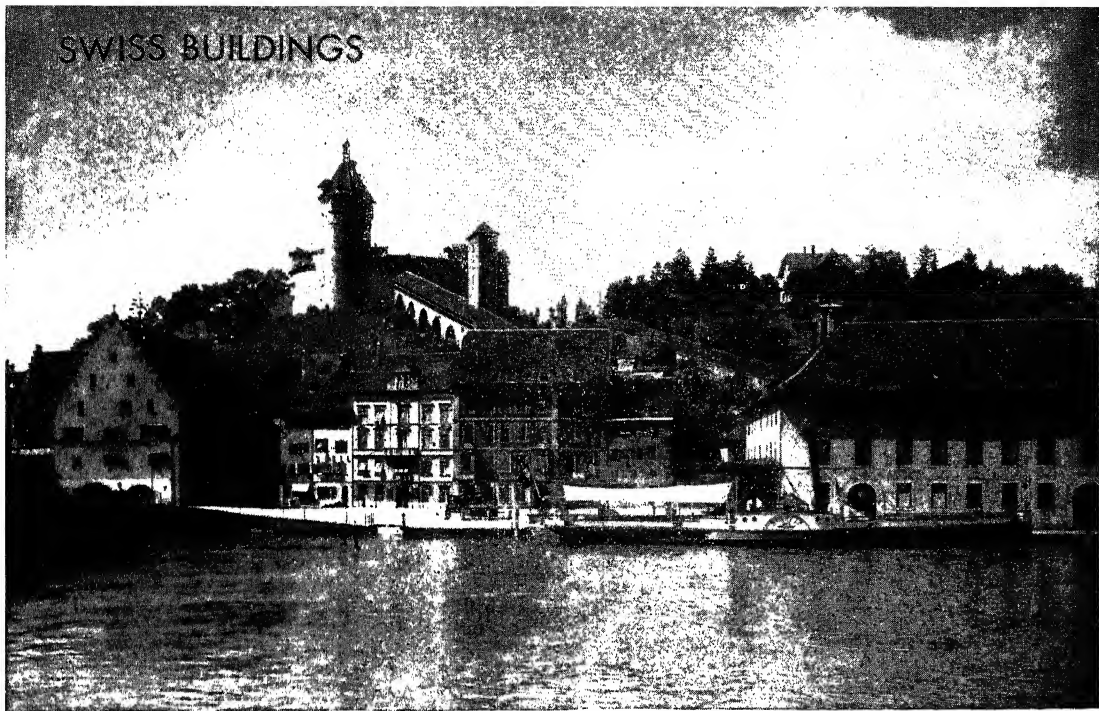
**Cities.** The charm of history mingles with the practicality of modern industry in the cities of Switzerland. The Swiss cities are clean and up-to-date, with beautiful trees and well-kept gardens. Geneva and Berne, the capital of Switzerland, are described under their own names in THE WORLD BOOK ENCYCLOPEDIA. Other important cities are described below:

**Basel, Bâle** (population 162,105), is the northern gateway of Switzerland. The city is a great railroad center, and has one of the largest railroad stations in Europe. Basel lies on the Rhine River, forty-three miles north of Berne. It has been famous for 200 years for the manufacture of silk ribbons, paper, and dyes. Tanning and brewing are also important industries.

The city was once a frontier post of the Roman Empire. It is the home of an ancient cathedral, founded in 1019, which contains the tomb of Erasmus. The oldest university in Switzerland was founded in Basel in 1460.

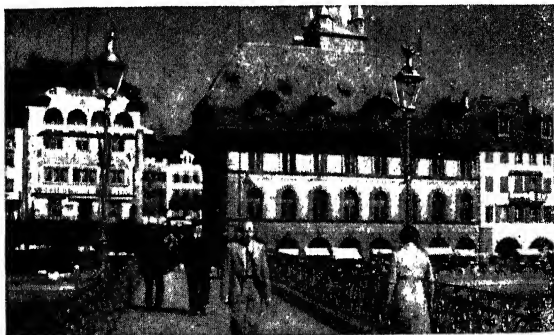


## SWISS BUILDINGS



**Schaffhausen on the Rhine** in Switzerland is a delightful and quaint city that attracts thousands of visitors yearly. The

walls and towers of an old fortress stand watch above the public square and wharf on the historic river.



**Picturesque Architecture** in a picturesque country. The large building is the old city hall in the city of Lucerne.



**One of the Many Modern Business Buildings** which are in the interesting old city of Zurich



**Girls of Grisons** in their becoming native costumes. The attractive farmhouse is typical of the region.



Swiss Farmers Inspect One of Their Famous Products — Cheese



Photos: Stettler, Hitzli, Swiss

Weaving Is an Important Swiss Industry

The city has a valuable collection of the works of the Holbeins, who once lived in Basel.

**Interlaken**, *IN ter lakh en* (population 4,042), is a village in the valley of the Aare River. The name *Interlaken* means *between the lakes*. The village is situated between Lakes Thoun and Brienz. It is one of the most popular Alpine resorts. In the center of this little town is an ancient Augustinian monastery which was founded in 1130. The monastery is now occupied by government offices.

**Lausanne**, *loh ZAN* (population 92,541), is a tourist center which lies less than a mile from Lake Geneva. It is built on and around five hills. A high viaduct, or road built up over the valley, connects two of the hills. The city has a fine view of the lake and the mountains of Savoy and Valais.

A beautiful seven-hundred-year-old Gothic cathedral is one of Lausanne's landmarks. An ancient castle stands close to the cathedral. Many of the old buildings in Lausanne were torn down or greatly changed when the city was improved and modernized. Lausanne became important industrially after the Simplon Tunnel was opened in 1906. But Lausanne is most famous as an educational center. The University of Lausanne was founded as an academy in 1537, and became a university in 1890.

**Lucerne**, *loo SURN*, officially LUZERN (population 54,716), is an attractive city on the banks of Lake Lucerne. The River Reuss divides the city into two parts. The modern part is on the west. The old town, which dates from the Middle Ages, and has crooked, narrow streets and old-fashioned houses, is on the east. The *Hofkirche*, a church dating from 1506, is in this part of the city. Other landmarks include the old town hall, with its collection of art and antiques, and the famous "Lion of Lucerne." This is a huge lion carved in solid rock, as a memorial to the Swiss Guards who died defending the Tuileries in the French Revolution.

**Neuchâtel**, *nyoo shah TEL* (population 23,799), lies beside Lake Neuchâtel, twenty-five miles west of Berne. It is situated on a gentle slope which rises from the shores of the lake. Lovely old buildings include an abbey church built in the 1100's, and the ancient castle of the Counts of Neuchâtel. The castle is now used as a government building.

The city has many fine public buildings, museums of art and natural history, and a well-equipped public library. It is also the home of the University of Neuchâtel, founded in 1866. Neuchâtel is an important railway center. The chief industries are watchmaking and the manufacture of jewelry and electrical goods.

**Saint Moritz**, *saynt MO ritz* (population 2,305), is a famous resort town. It lies over 6,000 feet above sea level, in the upper part of the great valley known as the Engadine. St. Moritz is the highest village in the valley,

and has a magnificent view. Health seekers come to St. Moritz from all over the world. The city's baths have been famous since the 1500's, when the great physician Paracelsus first called attention to them. The city is a center for winter sports and has world-famous ski runs.

**Zurich**, *ZOOR ik* (population 336,395), is the largest city in Switzerland. It is situated at the northern end of Lake Zurich. The old city has steep, narrow streets and old-fashioned houses, but the newer sections are completely modern. The Limmat River flows through the middle of the city and divides it into two parts, which are called the Little City and the Great City. Eleven bridges cross the river to connect the two parts of Zurich.

There are many famous buildings in Zurich. The National Museum contains relics of the early days of the republic. A Romanesque cathedral in Zurich was built in the 1000's. The famous Swiss reformer Ulrich Zwingli was once pastor there. Zurich is a noted center of learning. The cantonal university, founded in 1832, is the greatest institution of higher learning in Switzerland. It is especially famous as a medical school. The federal engineering school is also located in Zurich. There are many other excellent schools, and one of the finest botanical gardens in the world. Silk-weaving is the most important industry. Cotton goods and machinery are also manufactured.

### Social and Cultural Achievements

**Leading Universities:** *Basel* (founded in 1460), *Zurich* (1832), *Berne* (1834), *Geneva* (1559), *Lausanne* (1537), *Fribourg* (1889), *Neuchâtel* (1866), *Swiss Federal Institute of Technology* at Zurich (1855), *University Institute for International Studies* at Geneva (1927).

**Leading Museums and Art Galleries:** *Town Hall* at Lucerne; *Museums of Antiquities, Fine Arts, and Natural History* at Geneva; *Swiss National Museum* at Zurich; *Historical Museums* at Basel and Berne.

**Education.** Switzerland has very high educational standards. Almost everybody can read and write. Children are required by law to attend school, but the years of required school attendance vary in different cantons. Boys and girls usually attend the same schools. There are many trade and technical schools, and seven universities. There are also a number of schools of art and music. Switzerland has produced many famous writers on education, including Jean Jacques Rousseau and Johann Pestalozzi.

**Libraries.** Switzerland has many libraries. The seven great universities have libraries which are large and up-to-date. The Swiss National Library, a handsome modern building in Berne, has a copy of every book ever

# SWITZERLAND

Aarau, *12,841.....	F 2	Bonfol, 1,014.....	D 2	Egnach, 3,134.....	H 1	Horgen, 8,889.....	G 2
Aarberg, 1,815.....	E 2	Bönigen, 1,513.....	E 3	Einsiedeln, 8,421.....	G 2	Hospenthal, 300.....	G 3
Aarburg, 2,911.....	E 2	Boswil, 1,410.....	F 2	Elgg, 1,951.....	G 2	Huttwil, 4,376.....	E 2
Aare (river).....	F 3	Boudry, 2,501.....	C 3	Elm, 786.....	H 3	Igis, 2,478.....	J 3
Aargau (canton),		Breitenbach, 1,181.....	E 2	Emmen, 8,659.....	F 2	Ilanz, 1,495.....	H 3
269,873.....	F 2	Bremgarten, 3,179.....	F 2	Emmen Tal (district).....	E 3	Illnau, 3,918.....	G 2
Adelboden, 2,640.....	E 3	Brien, 2,641.....	F 3	Engadine (district).....	J-K 3	Ingenbohl, 3,990.....	G 2
Aesch, 616.....	F 2	Brienzer Rot Horn (mt.).....	F 3	Engelberg, 2,302.....	F 3	Inn (river).....	K 3
Aeschi, 1,334.....	E 3	Brienzer See (lake).....	E 3	Engi, 1,141.....	H 3	Innertkirchen, 1,323.....	F 3
Affoltern, 1,154.....	E 2	Brig, 3,144.....	E 4	Ennenda, 2,792.....	H 2	Ins, 2,054.....	D 2
Aigle, 3,906.....	C 4	Brigels, 1,108.....	H 3	Entlebuch, 3,182.....	F 3	Interlaken, 4,042.....	E 3
Airolo, 1,733.....	G 3	Brione, 335.....	G 4	Ependes, 270.....	C 3	Intragna, 848.....	G 4
Albeuve, 614.....	D 3	Brissago, 1,780.....	G 4	Erlach, 761.....	D 2	Isenthal, 536.....	G 3
Albrist Horn (mt.).....	D 4	Brittnau, 2,788.....	E 2	Erlenbach i.S., 1,392.....	E 3	Jaun, 769.....	D 3
Allaman, 389.....	B 4	Brugg, 4,773.....	F 2	Ermenen, 1,561.....	H 1	Jegenstorf, 1,154.....	D 2
Alle, 1,317.....	D 2	Brusio, 1,493.....	K 4	Ernen, 316.....	F 4	Jenaz, 995.....	J 3
Allschwil, 7,306.....	E 4	Hubendorf, 1,337.....	E 2	Erstfeld, 3,453.....	G 3	Joch Pass.....	J 3
Alpes Valaisannes (mts.).....	E 4	Hubikon, 1,919.....	G 2	Eschenbach, 2,425.....	G 2	Jona, 3,252.....	F 2
Alpnach, 2,736.....	F 3	Buchs, 4,759.....	H 2	Escholzmat, 3,500.....	E 3	Jungfrau (mt.).....	E 3
Altäro, 5,694.....	G 3	Bülach, 3,868.....	G 1	Estavayer-le-Lac, 2,127.....	C 3	Jussy, 634.....	B 4
Alttau, 940.....	H 1	Bulle, 4,615.....	D 3	Evolène, 1,274.....	D 4	Kappell, 1,752.....	H 2
Altstätten, 8,185.....	J 2	Buochs, 2,036.....	F 3	Faido, 1,066.....	G 4	Kerns, 3,207.....	F 3
Alvaneu, 476.....	J 3	Büren, 1,930.....	D 2	Fiesch, 513.....	F 4	Kersers, 1,758.....	D 3
Amlikon, 268.....	H 1	Burgdorf, *10,148.....	E 2	Filisur, 393.....	J 3	Kilchberg, 4,538.....	F 2
Amriswil, 5,369.....	H 1	Bürigen, 2,523.....	G 3	Flawil, 5,879.....	H 2	Kippel, 340.....	E 4
Amsteg.....	G 3	Bürglen, 1,582.....	H 1	Fleurier, 3,345.....	C 3	Kirschberg, 2,567.....	E 2
Andeer, 603.....	H 3	Busen, 226.....	H 4	Flims, 1,050.....	H 3	Kirschberg, 5,327.....	H 2
Andermatt, 1,493.....	G 3	Bussigny, 1,380.....	C 3	Flüelen, 1,613.....	G 3	Kleinlützel, 1,204.....	D 2
Appenzell, 4,749.....	H 2	Bütschlegr (mt.).....	D 3	Fluh Berg (mt.).....	G 2	Klingnau, 1,573.....	F 1
Appenzell (canton),		Bütschwil, 3,356.....	H 2	Flums, 4,636.....	H 2	Klosters, 2,759.....	J 3
Ausser Rhoden).....	H 2	Buttes, 933.....	C 3	Frauenfeld, 9,579.....	D 3	Kloten, 2,018.....	G 2
Appenzell (canton), inner		Carouge, 7,944.....	B 4	Fribourg, *25,975.....	D 3	Koblentz, 742.....	F 1
Rhoden), 13,399.....	H 2	Castagnola, 2,379.....	G 4	Fribourg (canton),		Kölikken, 2,520.....	F 2
Apples, 607.....	B 3	Cazis, 1,254.....	H 3	151,664.....	D 3	Köniz, *14,364.....	E 3
Aquila, 655.....	G 3	Celerina, 626.....	J 3	Frick, 1,315.....	F 1	Kreuzberge (mt.).....	H 2
Arbedo-Castione, 1,425.....	H 4	Cernier, 1,339.....	D 2	Frienis Berg (mt.).....	F 2	Kreuzlingen, 9,069.....	H 1
Arbon, 7,845.....	H 1	Cevio, 365.....	G 4	Frutigen, 5,100.....	E 3	Kriens, 8,729.....	F 2
Ardez, 520.....	K 3	Chalais, 1,622.....	E 4	Fully, 2,762.....	D 4	Kubli, 657.....	J 3
Ardon, 1,243.....	D 4	Cham, 4,047.....	F 2	Furka Pass.....	F 3	Küsnacht, 7,200.....	G 2
Ardesheim, 3,360.....	E 2	Chamoson, 2,003.....	D 4	Fusio, 133.....	G 4	Küssnacht, 5,123.....	F 2
Arolla.....	D 4	Champéry 807.....	C 4	Gadmen, 525.....	J 2	L'Abbaye, 1,047.....	B 3
Arosa, 1,919.....	J 3	Charmey, 1,304.....	D 3	Gais, 2,248.....	D 3	Lac de Joux (lake).....	B 3
Arth, 5,145.....	G 2	Château d'Oex, 3,335.....	D 4	Galmiz, 466.....	D 3	Lac de Morat (lake).....	D 3
Arzier, 349.....	B 4	Châtellard, Le (see		Gampel, 761.....	E 4	La Chaux de Fonds,	
Ascona, 2,416.....	G 4	Montreux).....	C 4	Gelterkinden, 2,705.....	E 2	*30,939.....	C 2
Attalens, 1,120.....	C 3	Châtel St-Denis, 2,857.....	C 3	Genève, Lake.....	C 4	Lachen, 3,205.....	G 2
Aubonne, 1,643.....	B 4	Chavornay, 1,305.....	C 3	Genève (canton), 174,624.....	B 4	Langenthal, 8,047.....	E 2
Ayer, 441.....	E 4	Chevroux, 349.....	C 3	Gersau, 1,878.....	D 2	Langnau, 8,690.....	E 3
Baar, 6,187.....	G 2	Chebbres, 1,033.....	C 4	Gestler (mt.).....	D 2	Langnau, 1,746.....	G 2
Baden, *10,313.....	F 2	Chebbres, 358.....	C 3	Giboux (mt.).....	D 3	Langwies, 351.....	J 3
Bad Ragaz, 2,430.....	H 2	Chiasso, 6,161.....	H 5	Gilly, 527.....	B 3	La Roche, 1,128.....	D 3
Bagnes Châbles, 3,652.....	D 4	Chironico, 605.....	G 4	Glion, 1,046.....	G 4	La Tour de Peilz, 4,463.....	G 4
Balerna, 2,435.....	G 5	Chur (Coire), *17,128.....	J 3	Giornico, 697.....	F 3	Lauenen, 630.....	D 4
Balsthal, 4,770.....	E 2	Churfirsten (mt.).....	H 2	Giswil, 2,437.....	F 3	Läufelängen, 1,008.....	E 2
Barthwil, 2,497.....	G 2	Churwalden, 737.....	J 3	Giubasco, 3,009.....	H 4	Laufen, 2,815.....	D 2
Basel (ALE), *161,380.....	E 1	Claro, 875.....	H 4	Glâne (river).....	C 3	Laufenburg, 1,534.....	F 1
Basel Land (canton),		Concise, 644.....	C 3	Glarnisch (mt.).....	H 2	Laufen-Uhwiesen, 782.....	G 1
.....	E 2	Constance, Lake (Boden		Glarus, 5,264.....	H 2	Laupen, 1,304.....	D 3
.....		See).....	H 1	Glarus (canton), 34,747.....	H 3	Lauperswil, 2,793.....	E 3
.....		Conthey, 3,446.....	D 4	Glatt (river).....	G 2	Lausanne, *92,078.....	C 3
.....		Coppet, 491.....	B 4	Glattfelden, 1,843.....	F 1	Lauterbrunnen, 2,800.....	E 3
.....		Cornolles, 1,277.....	C 3	Gordola, 1,096.....	G 4	Le Lien, 917.....	B 3
.....		Cossonay, 1,073.....	C 3	Göschenen, 834.....	H 2	Le Locle, *11,363.....	C 2
.....		Corgemont, 1,168.....	D 2	Gossau, 7,490.....	H 2	Le Mont, 1,185.....	C 3
.....		Courgenay, 1,441.....	D 2	Grabs, 4,309.....	H 2	Lengnau, 2,376.....	D 2
.....		Courroux, 1,605.....	D 2	Grandson, 1,713.....	C 3	Lenk, 1,729.....	D 4
.....		Court, 1,275.....	D 2	Gränichen, 3,542.....	F 3	Le Noirmont, 1,410.....	C 2
.....		Courtclary, 1,059.....	D 2	Graubünden (canton),		Lenzburg, 4,257.....	F 2
.....		Courtclère, 1,361.....	D 2	127,821.....	H 3	Lepontine Alps (mts.).....	G 4
.....		Couvet, 2,845.....	C 3	Greifen See (lake).....	G 2	Les Bois, 1,074.....	C 2
.....		Cully, 1,096.....	C 4	Grenchen, *10,900.....	D 2	Les Verrières, 1,191.....	B 3
.....		Damvant, 244.....	C 2	Grimsel Pass.....	F 3	Leuk, 2,242.....	E 4
.....		Davos Platz, 9,215.....	J 3	Grindelwald, 2,897.....	F 3	Leukerbad, 526.....	E 4
.....		Degersheim, 2,956.....	H 2	Grono, 510.....	H 4	Leydis, 3,217.....	D 4
.....		Dérmont, 6,585.....	H 2	Gross Andelfingen, 885.....	G 1	Liddes, 825.....	D 5
.....		Dengera, 230.....	B 3	Gross Scher Horn.....	G 3	Liestal, 7,216.....	E 2
.....		Dent Blanche (mt.).....	E 4	Gross Schreck Horn (mt.).....	F 3	Linth (river).....	G 3
.....		Dent de Ruth (mt.).....	D 3	Grosswangen, 2,340.....	F 2	Linthal, 1,694.....	H 3
.....		Derendingen, 3,744.....	E 2	Gruyères, 1,351.....	D 3	Littau, 5,136.....	F 2
.....		.....	D 4	Gryon, 567.....	D 4	Locarno, 6,804.....	G 4
.....		.....	E 3	Gsteig, 717.....	D 4	Lodrino, 640.....	G 4
.....		.....	G 1	Guggisberg, 2,511.....	E 3	Lossalto, 385.....	H 4
.....		.....	F 2	Gurtellen, 1,157.....	G 3	Lucens, 1,505.....	C 3
.....		.....	G 3	Guttannen, 398.....	F 3	Lugano, *17,000.....	G 4
.....		.....	E 4	Gyrenbach.....	G 2	Lugano, Lake.....	H 5
.....		.....	H 3	Hallau, 1,931.....	F 1	Lumbrein, 557.....	H 3
.....		.....	G 4	Heiden, 2,916.....	J 2	Lungern, 1,823.....	F 3
.....		.....	G 2	Heimberg, 1,505.....	E 3	Luthern, 1,975.....	E 2
.....		.....	D 3	Hemberg, 1,020.....	H 2	Lutry, 2,523.....	C 3
.....		.....	G 2	Henau, 6,091.....	D 4	Lützelrüth, 3,746.....	E 2
.....		.....	G 2	Hérémance, 1,565.....	H 2	Luzern, *54,821.....	F 2
.....		.....	E 2	Herisau, *12,737.....	H 2	Luzern (canton), 206,442.....	F 2
.....		.....	H 2	Herzogenbuchsee, 3,256.....	E 3	Luzern, Lake.....	F 2
.....		.....	C 3	Hinterrein, 103.....	G 2	Lyss, 3,508.....	D 2
.....		.....	F 2	Hinwil, 3,036.....	F 2	Maggia, 363.....	G 4
.....		.....	E 3	Hochdorf, 3,487.....	E 3		
.....		.....		Honegg (mt.).....			

of Switzerland. The most famous legend is that of William Tell, and how he shot an apple from his son's head at the command of a cruel Austrian official. This story was the inspiration for Friedrich Schiller's famous German drama, *William Tell*.

Another legend is told of Arnold von Winkelried, the soldier who is said to have won the battle of Sempach in 1386. The story tells that the Swiss were faced with a solid line of Austrian spearmen. Von Winkelried rushed forward and gathered half a dozen enemy lances into his own body. His action broke the Austrian line and the Swiss rushed through the opening to victory. No one knows now whether or not this really happened. But whether or not the legends are true, the Swiss were very successful in their wars.

In 1315 at Morgarten the Swiss mountaineers trapped and completely defeated an Austrian army ten times their strength. A long peace followed this victory. Other cantons entered the Confederation. These included Lucerne, Glarus, Zug, and Berne. Austria was further discouraged by fresh Swiss victories at Sempach and at Nafels in 1388.

**Swiss Independence.** Now the Swiss cantons took the offensive. They seized Aargau from Austria in 1415, and expanded in other directions, both by alliance and by conquest. Charles the Bold, Duke of Burgundy, tried to subdue the Swiss, but had no better luck than Austria. In 1476 the Swiss overthrew the proud Burgundian knights at the battles of Granson and Murten. By 1499 the Swiss had won their independence from the Holy Roman Empire, although this was not formally recognized until the Treaty of Westphalia was signed in 1648. Many Swiss soon became bored with peace and enlisted in the service of any foreign ruler who would hire them.

The bonds which held the Swiss cantons together were very slight. Each canton was like an independent republic. It governed itself as it chose, although it was allied to the other Swiss. Switzerland was more like a "League of Nations" than one nation. Not all cantons took part in every foreign war, and there were occasional civil wars between the cantons, and even between classes and parties in the same canton.

This was especially true after the Protestant Reformation. Zwingli, Luther, and Calvin were the three great figures of the early Protestant movement. Zwingli was a native-born Swiss. Calvin was a Frenchman, but he lived in Geneva and for many years ruled that city with an iron hand. There were Zwinglians, Lutherans, and Calvinists in Switzerland, and followers of other Protestant sects as well. But many Swiss remained Roman Catholic. Switzerland, like other nations, was torn apart by religious strife.

In the 1600's and 1700's, Switzerland found itself endangered also by the growing power of France. The armies of Napoleon swept down on the little republic in 1789, and quickly overran the country. Napoleon set up a centralized *Helvetic Republic*, which was in close alliance with France. All the old liberties of the cantons were wiped out. But in 1803 Napoleon granted a more satisfactory federal constitution for a republic of nineteen cantons. The fall of Napoleon restored the Confederation, with a few changes. In 1815 the Congress of Vienna guaranteed the perpetual neutrality of Switzer-

land, and that neutrality has never been broken.

The next struggle was for a greater national unity. The constitution of 1815 was no more satisfactory for Switzerland than the old Articles of Confederation were for the United States. In 1848 Switzerland took the step which the Americans had taken in 1787, and the confederation of states was made into a federal union. Some of the small, conservative cantons had formed an alliance and tried to resist these changes. The result was a short civil war in 1847, which ended in a complete victory for those who favored a close national union and a new federal constitution.

**A History of Peace.** The Swiss constitution was revised in 1874 to give greater powers to the central government. Many progressive social laws have since been passed. The federal government has worked successfully to build up the resources and industries of Switzerland.

"Happy is the nation without a history," an Italian scholar once said. Most of the great troubles of the last hundred years have passed by Switzerland. The little republic has escaped invasions, dictatorships, and famines. World Wars I and II swept around Switzerland rather than across it, but they brought urgent problems. Overseas trade was cut off, and the tourist industry disappeared. The danger of invasion made costly military precautions necessary. But the patriotic Swiss felt that these sacrifices were a small price to pay for peace and continued national freedom.

P.S.

**Related Subjects.** The reader is also referred to:

#### BIOGRAPHIES

Böcklin, Arnold	Piccard, Auguste, and Jean
Calvin, John	Spyri, Johanna H.
Guyot, Arnold H.	Tell, William
Jaques-Daleroze, Emile	Tussaud, Marie Gresholtz
Jung, Carl Gustav	Winkelried, Arnold von
Paracelsus, Philippus A.	Wyss, Johann Rudolf
Pestalozzi, Johann Heinrich	Zwingli, Huldreich

#### CITIES

Bern	Ge
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#### FEATURES

Alps	Saint Bernard, Great, and
Geneva, Lake	Saint Bernard, Little
Giesbach	Saint Gotthard
Jungfrau	Simplon Pass
Jura	Staubach
Lucerne, Lake of	

#### UNUSUAL

Doll (color plate)	Flag (color plate, Flags
Dress (Switzerland; color plate, Europe)	of Europe)
... plate, Europe)	Helvetian
Em ...	Home Life (color plate)
	League of Nations

#### Outline

- I. Introduction
- II. The Land and Its Resources
  - A. Location, Size, and Surface Features
  - B. Rivers, Waterfalls, and Lakes
  - C. Climate
  - D. Natural Resources
  - E. Conservation
- III. The People and Their Work
  - A. The People
  - B. Agriculture
  - C. Manufactures
  - D. Tourist Trade
  - E. Transportation and Trade
  - F.

IV. Social and Cultural Achievements

- A. Education C. Religion
- B. Libraries D. Recreation

V. Government

- A. The Cantons C. Defense
- B. The Federal Government

VI. History

- A. Wars with Austria C. A History of Peace
- B. Swiss Independence

Questions

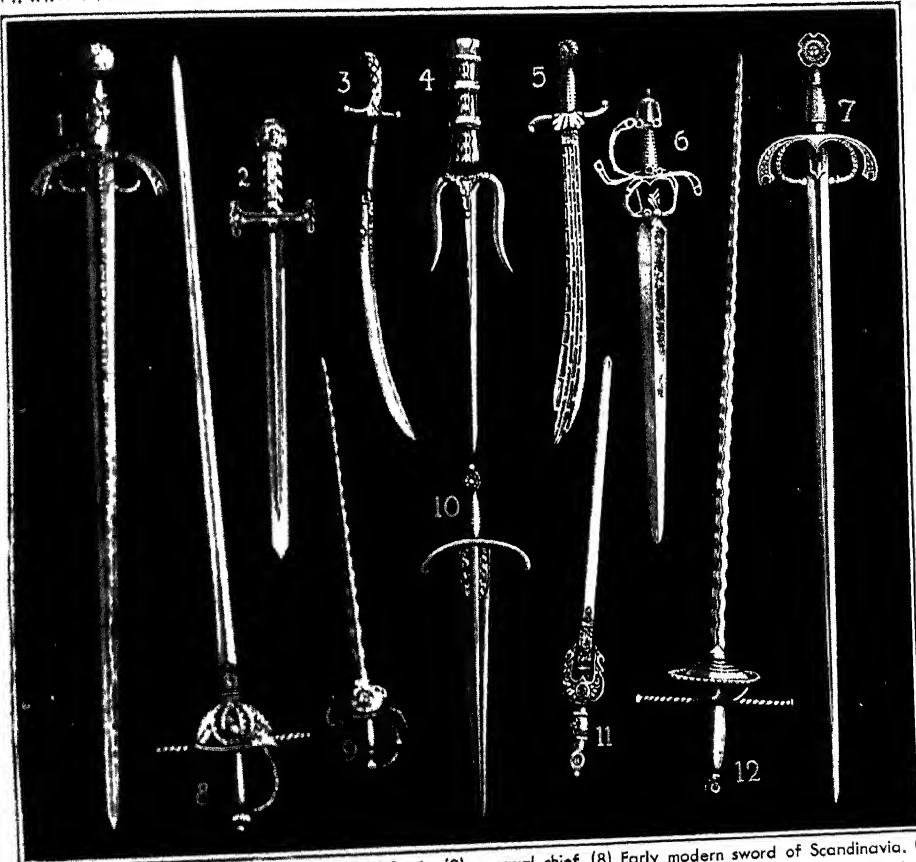
- Where does the name Switzerland come from?
- What nickname is often given to Switzerland? Why?
- How much of Switzerland is mountainous? What are the highest mountains in this country?
- What four important European rivers make their way through the country?
- About how much of the country is planted in crops?
- For what are the other "productive" areas used?
- Why do many people in poor health go to Switzerland?
- What unusual telephone device was perfected in Switzerland in 1946?
- What world-famous statue can be seen in Lucerne?
- To what is it a memorial?
- What are two famous Swiss legends?
- Why have the Swiss seldom feared military attack?
- How is the country prepared against attack?
- When was Switzerland finally united into a nation?

**SWITZERLAND OF AMERICA.** See BRITISH COLUMBIA; SOUTH AMERICA (Rivers and Lakes).

**SWORD, sohvd.** The sword is one of the oldest of all fighting weapons. Man turned his skill to the art of making weapons almost as soon as the art of working metals was discovered. The earliest swords we know about were those of the Assyrians, Gauls, and Greeks. Their swords were short, two-edged weapons made of bronze. The Roman sword was made of steel. It was a short straight weapon with a sharpened point and two cutting edges.

The *broadsword* is a broad-bladed, single-edged short sword, made for cutting but not for stabbing. The broadsword was once used by regiments of cavalry and Highland infantry in the British army. It was better for attack than defense. The *claymore*, a kind of broadsword, but double-edged and longer, was the national weapon of the Highlanders. The favorite weapon of the East was the scimitar, a blade with a decided curve. Damascus was noted for its fine scimitar blades.

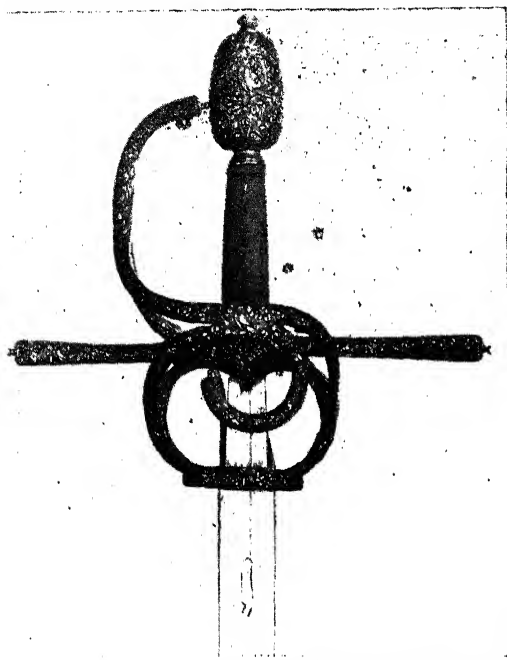
Weapons made for close fighting began to go out of date after the invention of gunpowder. Only the light rapier, for dueling, was still used. Great skill was used in tempering rapier blades. Toledo, Spain, became world-famous for its fine swords.



**Some Famous Swords.** (1) Sword of Isabella of Spain. (2) Sword of Francis I of France. (3) Persian sword of sixteenth century. (4) Moorish boarding sword. (5) Cutlass of the sixteenth century. (6) Sixteenth century sword. (7) Sword of

naval chief. (8) Early modern sword of Scandinavia. (9) Flaming sword of Don Juan of Austria. (10) Fifteenth century sword. (11) Sword of a cardinal in the court of Philip IV of Spain. (12) Flaming sword of Philip IV.





Metropolitan Museum of Art

**A Bavarian Sword**, made in 1610. The beautiful chased steel hilt is an outstanding example of the swordmaker's art.

Swords used by cavalry during the 1800's were from two and one-half to three feet long and weighed about two and one-half pounds. Such weapons have become of little value as the usefulness of cavalry has declined. The sword has given place to the saber in the United States Army. The saber is made for both cutting and thrusting.

There was hardly any cavalry action in World War I and little chance to use swords. The best weapon for the charges of foot soldiers was the bayonet, a blade a foot or more long, attached to the end of the rifle. Soldiers were taught to use this weapon with good effect. The sword was also of little use in World War II, when cavalry units were mechanized.

R. Gou.

See also **BAYONET**; **DAGGER**; **DUEL**; **FENCING**.

**SWORDFISH.** The swordfish is a large ocean fish with a long, rounded body. It has a long, flattened upper jaw that looks like a sword. The swordfish is given its name because of that jaw. This fish closely resembles the marlins and sailfish, but is different from them because it has a short-based back fin. The swordfish lives in all warm seas. The average length of a swordfish is seven feet, and the weight is about 250 pounds. Specimens weighing 600 or 800 pounds and measuring from ten to fifteen feet long have been caught. Swordfish are highly regarded by big-game fishermen.

Their "swords" are sharp-edged and strong, and half as long as the body. There have been several instances of swordfish charging boats and piercing the hulls. The sword is sometimes broken off by the force of the blow.

Commercial fishermen capture these fish by harpooning them from a pulpit on the bow of a sailboat. The flesh is coarse, but it has a good flavor when it is cut and cooked as a steak. Swordfish eat squid and menhaden,

herring, mackerel, and other fish that travel in schools.

Two other kinds of fish have pointed, bony spikes much like that of the swordfish. The *marlins* have a long-based but low dorsal fin along the back. The *sailfish* has a long, high, saillike fin along its back. L.P.Sc.

See also **MARLIN**; **SAILFISH**.

**Classification.** The swordfish is known as *Xiphias gladius*, the striped marlin as *Makaira mitsukurii*, and the sailfish as *Istiophorus greyi*.

**SWORD OF DAMOCLES.** See **DAMOCLES**.

**SWORDTAIL.** See **FISH** (Reproduction; color plate, Tropical Fresh-Water Fish).

**SYCAMORE.** This attractive shade tree has reddish-brown wood and belongs to the plane-tree family. It grows in fertile lowlands and along streams. It is found in great numbers in the United States from southern Maine to Nebraska and as far south as Texas and Florida. The sycamore may reach a height of 175 feet and be 14 feet through the trunk. The bark on the lower trunk of the tree is reddish brown and the bark on the branches is olive green. The bark on the branches breaks off in tiny scales. When these scales break off they show an inner bark which is light cream in color. This light bark on the branches gives rise to the popular phrase "hoary-antlered sycamore." The *buttonwood* is a name often given to some of the sycamores. Others are known as *plane trees*.

The sycamore tree can be recognized by its leaves, which are broad and have large teeth. The stem of each leaf is hollow at the base where it encloses the next year's bud. The flowers of the sycamore are of two types, those which bear *stamens* and those which bear *pistils*. Each type of flower grows in separate flower heads on different parts of the same tree. The fruits of the sycamore are



H. Armstrong Roberts

**Swordfish Travel in Pairs** during breeding season, and a fishing boat will often hook two of the leaping, speeding sword-nosed fighters. Heavy line and a strong pole are needed for the thrilling, backbreaking fight with a "sword."



• Bark of Some Syce  
bark of other trees. As the

does not stretch as much as  
of the bark

breaks apart, falls off, and leaves patches of the inner bark ex-  
posed. These places look as though they had been whitewashed.

Rutherford Platt



George J. Baezhold

Leaves of the Sycamore (left) are very large, and broader than they are long. The fruit (right) is a round ball.

borne in small balls which hang from drooping stems. Each ball is made up of many tiny dry fruits known as *achenes*, which are tightly packed together, to form the balls.

W.M.HAR.

**Classification.** The sycamore belongs to the family *Platanaceae*. The most common species is *Platanus occidentalis*.

**SYCAMORE MAPLE.** See MAPLE.

**SYDENHAM, SIDE en am, CHARLES EDWARD POULETT-THOMSON, BARON** (1799-1841), was a British statesman and Governor-General of Canada from 1839 to 1841. He was born at Wimbledon, Surrey, and as a young man worked as a merchant. In 1826 Sydenham was elected to Parliament and in 1834 became president of the Board of Trade. In 1839 he was sent to Canada to unite Upper and Lower Canada. He was killed in an accident near Kingston, Ontario. E.R.A.

**SYDNEY** (population 1,384,380), is the oldest and largest city in Australia. It is the capital of the state of New South Wales. The city lies on the southeastern

coast of Australia, and its great harbor is one of the finest in the world. Sydney was founded as a penal, or prison, colony on January 26, 1788. Today it is a thriving modern city.

Sydney harbor covers an area of twenty-two square miles and has a shore line more than 180 miles long. The largest ships in the world can anchor there. Bays and inlets cut into the coast line under richly wooded hills. Both rocky cliffs and sandy beaches lie on the edges of the harbor.

Many residential sections of Sydney lie along the water front, and close to the lovely ocean beaches. The people enjoy swimming, fishing, and boating in the harbor. The great Harbour Bridge connects Sydney with the suburbs of the northern shore.

Sydney is an important trading center. Most of the imports and exports of New South Wales flow through its harbor. Sydney also has its own manufacturing industry. The products include textiles, chemicals, metal products, processed foods, pottery and glass, and leather. The business district centers in the heart of the city, near Martin Place. Shops and cafés dot the sidewalks in the King's Cross area. The University of Sydney was founded in 1850. The city also has several technical schools, a public library, and art galleries.

Many of Sydney's streets were once tracks for horse-drawn carts. They wind and twist over the hilly land, and some of them are still very narrow. Much of Sydney's charm lies in its quaint, crooked streets, which are a reminder of earlier days.

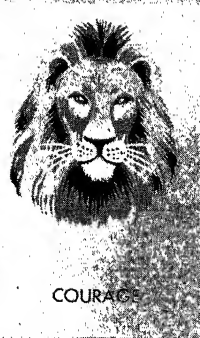
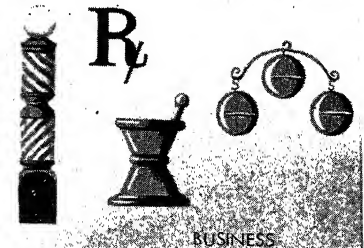
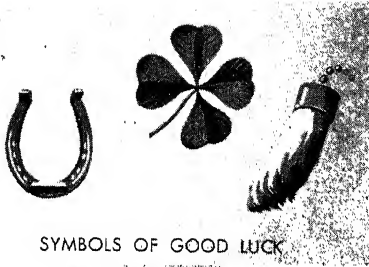
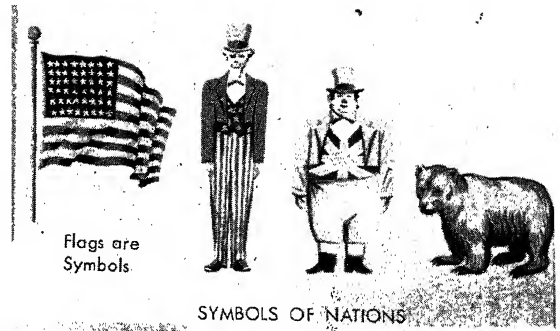
G.C.

**SYDNEY**, Nova Scotia (population 28,305), is a steel-making center and the second largest city in this Canadian province. The city was named for Lord Sydney, who was once Secretary of State for the Colonies. The city lies on the northern coast of Cape Breton Island. Sydney is the eastern terminal of several Canadian rail-



J. Wing Galloway

Governor's House in Sydney, Australia, is a Beautiful and Imposing Building



way lines. Steamship lines connect the city with all important Atlantic ports. Great quantities of steel products were made in the mills of Sydney during World Wars I and II.

D.C.H.

**SYENITE**, *SI eh nite*, is an igneous rock with a grainy texture, which is sometimes mistaken for granite. It is formed by the cooling and solidifying of molten material.

**SYLLOGISM**, *SIL oh jiz'm*. See LOGIC.

**SYLVESTER METHOD**. See ARTIFICIAL RESPIRATION.

**SYLVITE**, *SIL vite*. See POTASH.

**SYLVIVUS, AENEAS**. See PIUS (II).

**SYMBIOSIS**, *sim by O sis*, is the name given to the partnership of two different kinds of organisms, such as two plants or a plant and animal, in which both organisms benefit. Such a partnership occurs often in nature. For example, a fungus and an alga sometimes grow together and form a *lichen*, which is different from either plant. Each organism benefits from this close association. The fungus, which cannot produce its own food, gets its food from the alga. The alga gets protection from the fungus. See LICHEN.

Another instance of symbiosis occurs when a fungus or mold lives in the roots of a higher plant. The threads of the fungus plant may grow inside the roots of the higher plant, thereby getting material on which to live. The higher plant is thought to obtain certain of its foodstuffs from the fungus.

An interesting form of symbiosis between a plant and

an animal occurs in the fig plant. The fig can be pollinated only by a certain insect. The larva of this insect lives in the ovary of the plant, where it obtains its food. The plant and the insect are entirely dependent upon each other.

In cases where only one of the two organisms benefits from their association, this organism is known as a parasite and the living together is not symbiosis, but parasitism.

G.W.Bz.

**SYMBOL**. A symbol is a sign which stands for some object or an idea. All words are symbols. Spoken words are symbols for objects and ideas. The letters of the alphabet are symbols for certain sounds. These letters are combined to form the written words which are the symbols for spoken words.

One of the most familiar symbols of all nations is the national flag. To every person the flag of his nation means "my country." The military insignia worn on the uniform of a man in the armed services are symbols. They show to which service he belongs, what rank he holds, and what his duties are.

Animals and colors have almost a world-wide symbolism. Black represents grief among Americans and Europeans, and white is the symbol of purity and innocence. In some countries however, white stands for mourning. Blue usually stands for sincerity, and purple represents royalty. A lion is the symbol for courage, a lamb suggest shyness, and the dove and olive branch

symbolize peace. The skull and crossbones is a pictured symbol which, according to law, must be placed on all containers of poison. It stands for death.

**Religious Symbols.** Every religion has symbols, especially in pictures. The Cross is the symbol of Christianity. The ship was an early Christian symbol which represented the Church, in which "the faithful are carried over the sea of life." The Gospel writers are represented by symbols. The winged man is Saint Matthew, the winged lion is Saint Mark, the winged ox is Saint Luke, and the eagle is Saint John. Other saints carry symbols which distinguish them. Saint Mary Magdalene carries a box or vase (for ointment), Saint Paul carries a sword, and Saint Andrew holds a cross.

**Symbols in Mythology.** There are numerous symbols in mythology. The peacock is the symbol of Juno, and the mirror and the apple are symbols of Venus. The trident, a three-pronged spear, is the symbol of Neptune.

**Scientific Symbols.** Such sciences as mathematics, chemistry, astronomy, botany, and biology have special sets of symbols to represent the many objects, elements, and operations involved in their study. These scientific symbols are used instead of words. Some of the symbols in astronomy are so ancient that it is not known how they began. Symbols for the chief heavenly bodies are:

Sun ☉	Jupiter ♃	Pallas ♀
Venus ♀	Uranus ♅	Vesta ♁
Moon ☾	Mercury ☿	Saturn ♄
Ceres ♀	Earth ☿ and ☷	Neptune ♆
Juno ♀	Mars ♂	

A star is represented thus: ✨.

The phases of the moon are indicated in this manner: ☾ new moon; ☾ moon in first quarter; ☷ full moon; ☾ moon in last quarter.

There are many mathematical symbols. First, there are the symbols of value, the Arabic and Roman numbers, and the letters of the alphabet. Then there are the symbols of operation, such as +, the sign of addition, −, subtraction, X, multiplication, and ÷, division. The symbol  $\pi$ , which is called pi, stands for the number 3.1416. Pi is used to figure the area, circumference, and diameter of circles. The letter  $c$  stands for circumference,  $d$  for diameter,  $v$  for volume, and  $a$  for area.

In chemistry, an element is designated by its first letter, or its first letter and another letter of its English, Latin, or German name. Two symbols taken from the Latin are *Hg*, the symbol for mercury, and *Fe*, the symbol for iron. *H* stands for hydrogen, and *O* for oxygen. *H<sub>2</sub>O* is the symbol for water. The small figure 2 signifies two parts of hydrogen to one part of oxygen, which is the chemical make-up of water. E.L.S.W.

**Related Subjects.** The reader is also referred to:

Alphabet	Heraldry
Cartouche	Insignia
Color (Color)	Liberty Cap
Significance)	Pennant
Crescent	Seal
Element, (Chemical table)	Shorthand
Flag	Swastika

**SYMINGTON, WILLIAM** (1763-1831). See SHIP (Invention of the Steamship).

**SYMPATHETIC INK.** See COBALT.

**SYMPATHETIC NERVOUS SYSTEM.** See NERVOUS

**SYMPHONY, SIM foh nih**, is a musical composition in sonata form, written for an orchestra. It usually has four movements beginning with allegro, and followed by a slow movement, a minuet or scherzo, and a finale. The symphony as known today was first developed and made great by Haydn and Mozart. Beethoven's genius raised it to even greater heights, as did the work of such masters as Mendelssohn and Brahms.

The greater part of programs played by large symphony orchestras today is made up of symphonic works. The radio and phonograph records offer many opportunities to hear great symphonies. Beethoven's Third (*Eroica*), Fifth, Sixth (*Pastoral*), and Seventh (*Dance*) are often heard. His great Ninth (*Choral*) Symphony is often performed. Other well-known symphonies are Tchaikovsky's Fourth, Fifth, and Sixth (*Pathétique*), Brahms' First, Second, Third, and Fourth, Franck's only symphony (in D Minor), Schubert's Seventh and Eighth (*Unfinished*), and Dvořák's *Symphony from the New World*. See also ORCHESTRA. R.KEN.

**SYMPHONY ORCHESTRA.** See ORCHESTRA.

**SYNAGOGUE, SIN ah gog**, is a Jewish house of worship. Synagogues are believed to have been started during the Babylonian captivity in the 500's B.C. At the time of Jesus there were synagogues wherever the Jews had settled. Synagogues also served in early days as law courts and places of religious instruction.

The ancient synagogue was built so that the worshiper, on entering or at prayer, faced in the direction of Jerusalem. The most important articles were the chest, known as the Holy Ark, in which the rolls of Scripture were kept, a lamp that burned all the time to symbolize the presence of Jehovah, and candlesticks for use on the Sabbath and feast days. The ruler of the synagogue was responsible for the conduct of the service, and he chose those members who took part in it by praying or reading the Scriptures. The congregation was divided by a screen, with the men sitting on one side of it and the women on the other.

The modern synagogue has kept such self-governing features as management by a board of directors, known in Biblical times as the board of elders. Synagogues today vary greatly in beliefs and practices. L.L.M.

**SYNAGOGUE COUNCIL OF AMERICA** is the united voice of American Jewry in all matters in which religion plays an important role. It is made up of the six leading national Jewish organizations in the United States, including three rabbinic bodies and three laymen's groups. The Rabbinical Assembly of America and the Union of Orthodox Jewish Congregations in America represent Orthodox Jews in the Synagogue Council. The Rabbinical Council of America and the United Synagogue of America represent the Conservative Jews. The Central Conference of American Rabbis and the Union of American Hebrew Congregations represent the Reform group.

The council was founded in 1926 and has headquarters in New York City. It co-operates not only with the United States Government and the United Nations, but also with Protestant, Catholic, and other groups on social, civic, moral, and international matters. W.F.RO-

**SYNAPSE, sih NIPS.** See NERVOUS SYSTEM (Nerve



**SYNCOPE**, *SING koh PA shun*. See POPULAR MUSIC.

**SYNDICALISM**, *SIN dih kal iz'm*. Various groups are unwilling to trust private persons. The syndicalists agree with the socialists that it is not safe to trust private owners with the great power that comes from ownership of important industries and public utilities. They differ from the socialists in that they are equally unwilling to trust government.

There are many kinds of syndicalists, but all are agreed on the following three points:

Force is the basis of society, and any sweeping reforms of society must be made by force.

Power should never be centralized. Instead, small groups of workers should operate and control the particular plants, shops, or mines in which they work.

The weapon by which property and centralized government can be destroyed is the general strike.

Syndicalism began in France in 1892. It has made little headway anywhere in the world. P.S.W., JR.

**SYNDICATE**. See CARTEL (Types of Cartels); NEWSPAPER SYNDICATE.

**SYNDICS OF THE DRAPERS' GUILD**. See PAINTING (color plate, Great European Paintings); REMBRANDT.

**SYNECDOCHE**, *sih NEK doh kee*. See METONYMY.

**SYNGE**, *sing*, JOHN MILLINGTON (1871-1909), was an Irish dramatist. His plays dealt with Irish peasant life, and gave a fearless, tragic, and often mocking

picture of the Irish peasant's customs, and beliefs.

He was born at Rathfarnham, near Dublin, and was graduated from Trinity College. He later wandered over Europe, learning the stories and legends of the common people. In 1899 the poet William Butler Yeats found Synge in Paris. Yeats revived his love of Ireland and the Irish people and sent him back to Aran, an island in Ireland. Here Synge wrote studies of peasant life and several short poems. In 1903 he wrote his first plays, *The Shadow of the Glen* and *Riders to the Sea*. B.M.

**His Works** include *The Playboy of the Western World*; *The Tinker's Wedding*; *The Well of the Saints*; and *Deirdre of the Sorrows*.

**SYNOD**, *SIN ud*. See PRESBYTERIAN.

**SYNODIC**, *sih NAHD ik*, **MONTH**. See MOON (Moon's Motions).

**SYNONYM**, *SIN oh nim*, is a word that has the same, or nearly the same, meaning as another word. It comes from two Greek words meaning *associated* and *names*.

There are many cases when one word will serve the same purpose as another. For example, *small* boy and *little* boy; *smart* idea and *clever* idea; *kill* a man and *slay* a man. But although two words may be synonymous, or used in the same way, in one sense, they are not synonymous in another sense. For example, *dull* and *stupid* may both be used to describe a person. But one does not use the word *stupid* to describe the *dull* blade of a knife.



Chicago Architectural Photography Co.

This Chicago Synagogue clearly shows the strong influence of early Byzantine architecture. Even the chimney has been disguised as a graceful minaret. Many of the designs of the deco-

rations on the outside and inside were taken from the ruins of a synagogue built in Palestine about 1,900 years ago. This is the Temple Isaiah Israel.

Synonyms enrich the language by helping the speaker or writer to use words with distinct and definite meanings and associations. They also make it possible to avoid the monotony of repeating the same term. *s.m.s.*

**SYNOVIAL**, *sih NO vih al*, **FLUID**. See **JOINT**.

**SYNTAX**, *SIN takz*, deals with the arrangement of words in sentences, and with the grammatical relations of these words. Syntax comes from a Greek word meaning to *put together in order*.

"Can you the tire old fix not?" does not observe the rules of syntax. Phrases or clauses also may show errors in syntax, as in, "I was shown a book by a clerk in a red leather binding." The entire phrase beginning with "in" is out of order in the sentence.

In questions, "Did you see the glider?" is used in speech rather than, "Saw you the glider?" Several patterns may be used to express the same meaning. Both "The plane swooped down," and "Down swooped the plane" are correct. Punctuation also plays its part. "Paul put the game away," becomes entirely different as, "Paul, put the game away."

The putting together of sentence units is called *synthesis*. The breaking down of a sentence into its parts is *analysis*. *C.Spr.*

See also **ANALYSIS**; **GRAMMAR**; **PARTS OF SPEECH**; and their lists of Related Subjects.

**SYNTHESIS**, *SIN thee sis*, means the bringing together of two or more ideas or elements. In the chemical industry, the synthesis of coal and air and various other substances produces nylon. Many persons have spoken of America as a synthesis, or bringing together, of different races and nationalities. Philosophers often bring together many ideas. The combinations of these ideas is known as a synthesis. *M.R.C.*

See also **ENZYME**; **SYNTAX**.

**SYNTHETIC RESIN**. See **RESIN**, **SYNTHETIC**.

**SYNTHETICS**, *sin THEET iks*, includes several kinds of artificial substances. Some of them are manufactured to take the place of natural materials. An example is concrete, which may be considered an artificial stone. Other synthetics are much the same as the natural material, but they are prepared by chemical processes that do not use natural sources. For example, synthetic rubber is made from coal, instead of the sap of the rubber tree. In chemistry, a synthetic is a substance manufactured from simpler ones. An important example is synthetic ammonia, made from nitrogen and hydrogen.

Synthetics become important when the demand for a substance is too large for the natural supply, or when the supply is cut off as it often is in wartime. Natural supplies may also be shut off by monopolies. Quinine and rubber can both be prepared from coal tar, so the world no longer has to depend on plantations in the East Indies. A process developed in Germany can be used to manufacture gasoline from coal.

The synthetic plastics are substances that can be molded into any shape. Celluloid, one of the earliest synthetic plastics, is made from cellulose. Bakelite is another such plastic. There are many other synthetic plastics with hundreds of uses. They are used for making such different things as false teeth, electrical insulation, phonograph records, and table tops. Nylon is a synthetic product that can be squeezed into threads and used in-

stead of silk or bristles. Viscose rayon, which is much like silk, is made from cellulose.

Synthetics also include important medicines and industrial chemicals. Synthetic dyes made from coal tar have opened up a whole new industry. The powerful sulfa drugs are chemically much like these dyes. Indigo and camphor are other substances that can now be made in the laboratory.

Many synthetic substances are entirely new. So far as we know, they never existed until men made them. For example, there is no natural Bakelite or plexiglass. Neptunium and plutonium are synthetic chemical elements, although there is some evidence for their possible natural existence. They played an important part in making the atomic bomb. *G.I.Bu.*

See also **PLASTICS** (with list); **RAYON**; **RUBBER** (Synthetic Rubber).

**SYPHILIS**, *SIF ih lis*. See **VENEREAL DISEASE**.

**SYRACUSE**, *SIR ah kyooz*, was one of the most powerful cities of the ancient Greek world. A band of Greek colonists from Corinth founded the city about 800 B.C. The first settlement was on the small island of Ortigia, off the coast of Sicily. But the colony grew rapidly and soon spread to Sicily itself.

The history of Syracuse is told in the life stories of many great men who seized power there as tyrants, generals, or kings. They were soldiers who fought successfully in the long wars with Carthage. They were also patrons of literature and the arts. The tyrants of Syracuse waged a long struggle with Athens, and were at one time powerful enough to send a large army to Africa and attack Carthage on its own soil.

King Hieron (269-215 B.C.) was an ally of Rome, and fought Carthage in the First and Second Punic Wars. But after his death, Syracuse allied itself with Carthage and made war on Rome. In 212 B.C. a Roman army under Marcellus laid siege to the city. Archimedes, the famous mathematician of Syracuse, aided the defenders of the city with a number of clever devices which he invented. Archimedes was slain when the city finally fell. Syracuse then became the capital of the Roman province of Sicily. It was destroyed by the Saracens in A.D. 878, and never recovered its former greatness.

The modern city of Syracuse, or Siracusa (population 53,166), is built where ancient Syracuse once stood. It is famous chiefly for its ruins, and the monuments of its past glory. Some Doric columns of the ancient temple of Apollo remain, and parts of the temple of Athena may still be seen in a cathedral which has been built around the temple ruins. The fountain of Arethusa, which is famous in legend, is in the southern part of Syracuse.

Syracuse suffered some damage from shellfire during World War II. The British Eighth Army captured Syracuse on July 14, 1943. *G.B.W.*

See also **ARCHIMEDES**; **ARETHUSA**; **DIONYSIUS, THE ELDER**.

**SYRACUSE, N.Y.** (population 205,967). This important industrial center lies in the heart of a rich farming region. Syracuse is the fourth largest city in New York. It was once known as "The Salt City" because it produced so much salt. The city is a favorite meeting place for state conventions because it lies near the center of New York. The New York State Fair is held in the city.

**Location, Size, and Description.** Syracuse lies in the beautiful lake region of New York State. It is situated near Onondaga Lake, about 150 miles west of Albany and about the same distance east of Buffalo. The city covers nearly twenty-six square miles. Downtown Syracuse is built around Clinton Square and Saint Mary's Circle. Erie Boulevard has been built along the route of the old Erie Canal.

**Cultural Life.** Syracuse University is the most important educational institution in the city. It includes the New York State College of Forestry. Syracuse also is the home of Saint John's Academy (Roman Catholic), Pebble Hill School, and the Saint John's Military School (Episcopal). There are fifty public schools and sixteen parochial schools in the city. The public libraries contain nearly 200,000 volumes. The Court of Appeals Law Library in Syracuse has a collection of about 40,000 legal volumes. The city is the See of the Roman Catholic diocese and the state headquarters of the Baptist and Congregationalist churches.

**Recreation.** Syracuse has 170 parks that cover more than 1,000 acres. Thornden Park, with its amphitheater and the famous Mills Rose Garden, is one of the most beautiful parks in the city. Among the near-by lakes are Ontario, Onondaga, Cazenovia, and the Finger Lakes. State parks near Syracuse include Clark Reservation at Jamestown, Green Lakes State Park at Fayetteville, Chittenango Falls State Park near Cazenovia, and Selkirk Shores State Park on Lake Ontario. The region of the Thousand Islands begins about ninety miles north of the city. The Onondaga Indian Reservation, the capital of the Iroquois Confederacy, is south of the city. The United States Naval Center which was operated at near-by Sampson during World War II was the second largest of its kind in the world. The center covered more than 2,500 acres.

**Industry and Trade.** Syracuse is the market center for a large farming region that produces dairy products, fruits, and vegetables. Syracuse factories make air-conditioning machinery, air-cooled engines, tool steel, automobile gears, differentials and transmissions, roller bearings, farm machinery, foundry and machine-shop products, boilers, radiators, electrical appliances and washing machines, steam clothes-pressing machines, cash carrying and conveying equipment, typewriters, cans and can-making machinery, furniture, chinaware, wax candles, shoes, and hand bags.

**History.** The first settlers came to this region after the Revolutionary War. The village was incorporated in 1825. In 1847 Syracuse annexed the village of Salina and near-by territory and was chartered as a city. W.E.Y.

**SYRACUSE, BATTLE OF.** See BATTLES, FIFTEEN DECISIVE.

**SYRACUSE UNIVERSITY** is a privately controlled, coeducational school at Syracuse, N.Y. It has colleges of liberal arts, medicine, fine arts, law, applied science, forestry, home economics, and business administration. Its schools include those of education, library science, public speech and dramatic art, nursing, extension teaching, journalism, and citizenship and public affairs. Courses lead to all usual university degrees. Syracuse University was founded in 1871 and has an average enrollment of about 6,500. M.Z.C.

**SYR-DARYA,** *see* DAHR yah, RIVER. See ARAL SEA.

**SYRIA,** *SIR ih ah*, is an ancient country at the eastern end of the Mediterranean Sea. Wandering tribesmen settled on the shores of Syria more than 4,000 years ago. They explored the eastern regions of the new country, but found only great desert wastelands. So they returned from the desert and built their homes along the narrow strip of fertile coast land. About 2000 B.C. the country came to be known as Syria.

Much of the early history of Syria is told in the Bible. Syria originally included what is now Palestine and Lebanon, but the name is now generally limited to the northern part, the political area known as Syria. Southern Syria was the first great national home of the Israelites, and it later became the birthplace of the Christian religion. Moslem tribes invaded the country about A.D. 600, and Syria has been an Arab land ever since.

Syria itself has never been a powerful country. But time and again its important location has made the country a battleground. Syria won its independence during World War II, but freedom did not bring peace. Western countries continued their struggle for power in Syria and the Middle East.

#### The Land and Its Resources

**Location, Size, and Surface Features.** Syria covers an area of 54,300 square miles. It is about as large as the state of Illinois. The country is made up of Syria itself and the regions of Latakia in the northwest and Jebel Druze in the south. For the boundaries of Syria, see TURKEY (colored map).

Syria's coastal strip is about 60 miles wide and 85 miles long. It reaches the Lebanon border in the south. The great Syrian Desert lies east of the coastal strip.



Location Map of Syria

High hills branch off from the Anti-Lebanon ranges, near the Lebanese border, and stretch northeastward for more than 250 miles to the Euphrates River. The highest point in the country is Mount Hermon (9,056 feet), which rises on the border between Syria and Lebanon. Lowlands and dry plains lie north and south of the Anti-Lebanon mountain chain.

**Rivers and Lakes.** The Euphrates River is the longest waterway in Syria. It flows southeast for 300 miles



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**Camera Portrait of an Aged Man of the Syrian Desert**

through the Syrian Desert, and empties into the Persian Gulf at the southeastern tip of Iraq. The Orontes and Litani rivers are unimportant streams. They wind south along the eastern edge of the coastal strip and cut sharply west to empty into the Mediterranean Sea.

**Climate.** The desert regions of Syria are hot and dry. The temperature near the coast is mild throughout most of the year. In some inland places the rainfall is heavy. Rain falls only between the months of October and May. During the summer, scorching desert winds sometimes blow into the coast lands. Snow and frost are often found in the mountain regions.

**Natural Resources.** The lack of water is one of Syria's greatest problems. Most of the eastern regions are barren wastelands. The narrow coast land belt has fertile soils. Much of the land is porous, and rainfall is absorbed quickly. Most of the land is too dry for great timber growth, but there are some pine and oak trees. Mineral deposits are few and undeveloped, although there are some traces of phosphates, lead, copper, and nickel.

**Conservation.** Irrigation is very difficult in Syria. There are many small streams and watercourses, but only a few of them are suitable for irrigation. Most of the waterways are either too small or are sunk too deeply into the ground.

**The People and Their Work**

**The People.** Syria has a population of 2,860,411. The average density of population is 53 persons per square mile. Most of the people are Arabs, but there are also Turks, Kurds, Circassians, Armenians, Greeks, and Persians.

**Agriculture.** Syria is chiefly an agricultural country.

The chief crops include wheat, corn, barley, cotton, and hemp. The vegetables grown include chick-peas, lentils, beans, cucumbers, artichokes, and eggplants. Many kinds of fruit trees grow in irrigated orchards. Olive trees flourish throughout the country. Areas near Damascus are well known for raisin grapes. Pistachio trees are cultivated for their nuts, and white mulberry trees are grown to feed silkworms.

Most Syrians are farmers. Their farming methods are very old-fashioned. Wooden plows drawn by oxen still are used in many of the fields. Sheep and cattle raising are also important occupations. Syrians breed many thousands of goats, camels, oxen, and donkeys.

Other industries are small and undeveloped. A few factories produce flour, oil, silk thread, and wine.

**Transportation.** Travel is difficult in the desert and mountain land of Syria. There are only a few good roads, but some of them have bus lines. One of the longest roads follows the old trade highway along the Euphrates, and links Aleppo with Iraq.

There are few railroads in Syria, and most of them are poor. The longest railroad line runs for 325 miles from Aleppo to the Iraq border. Other lines link Syria with Turkey and Palestine.

**The Cities.** Damascus, the capital and largest city of Syria, is described under its name in *THE WORLD BOOK ENCYCLOPEDIA*. Two other important cities are described below.

**Aleppo, *ah LEP oh*** (population 320,167), is an ancient city eighty miles east of the Mediterranean Sea. Thousands of years ago, old caravan routes between Asia and Europe passed through Aleppo. The city was part of Turkey until new boundaries were drawn after World War I.

Today Aleppo is a colorful and prosperous trading center. It is famous for the costly silk materials which are manufactured there. Aleppo has been called "the Chicago of the Middle East," because of its industry.

**Antioch, *ah TIK ohk***, an ancient capital of Syria, was built on the fertile banks and vine-covered slopes of the Orontes River. It lay twenty miles inland from the



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**Wheat Is Cracked in a Stone Pestle by a group of Syrian farmers swinging wooden mauls near the city of Aleppo.**